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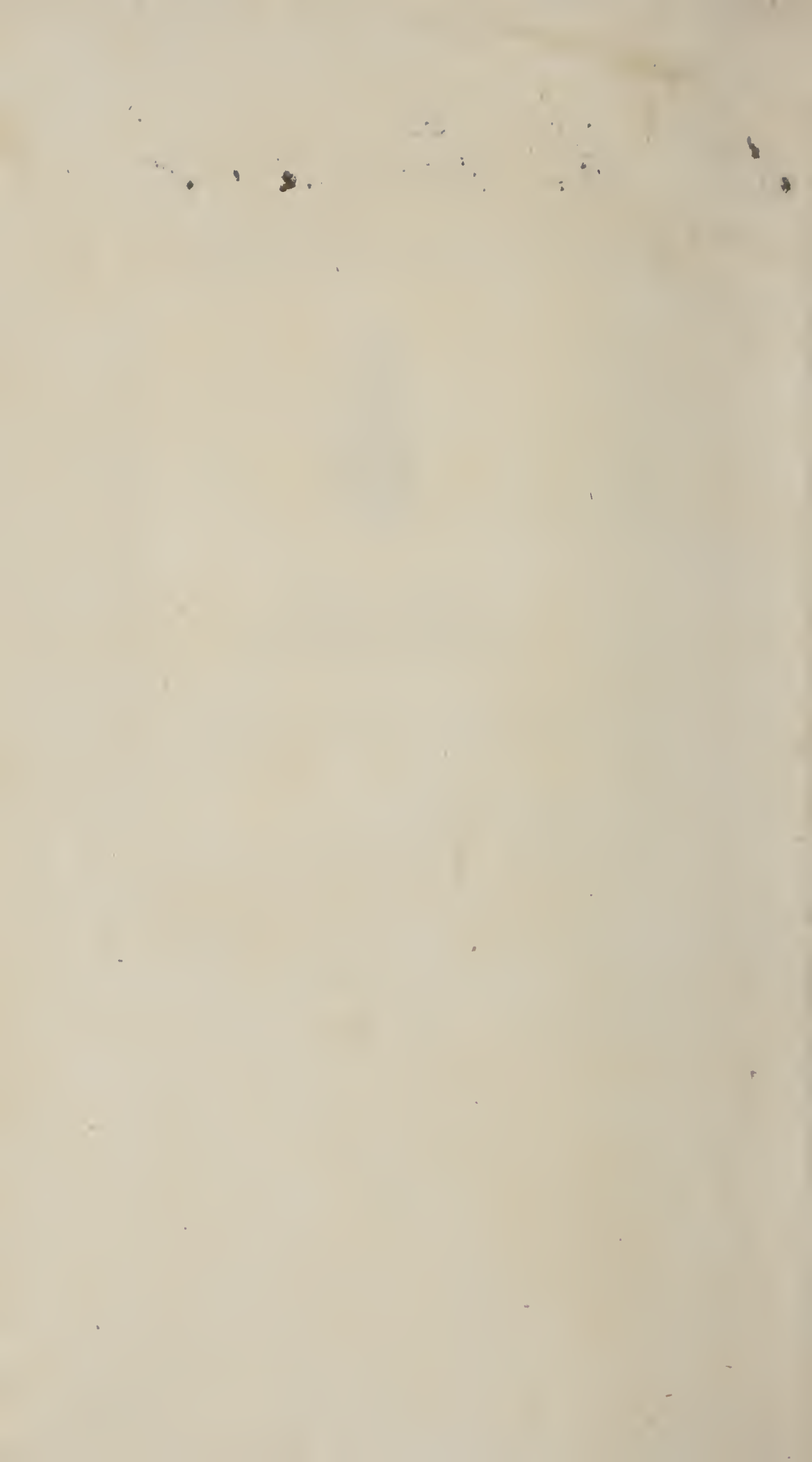
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W. L. Howard



AN
INTRODUCTION
TO THE
NATURAL HISTORY AND CLASSIFICATION
OF
Insects,
IN A
SERIES OF FAMILIAR LETTERS.
WITH
ILLUSTRATIVE ENGRAVINGS.

BY PRISCILLA WAKEFIELD.

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PREFACE.

AMONGST the beneficial improvements of modern times, few deserve higher estimation, than the increased attention to the education of children of all ranks; which is greatly facilitated by the number and variety of judicious books that have been written for their instruction and amusement. Nonsense has given way to reason; and useful knowledge, under an agreeable form, has usurped the place of the Histories of Tom Thumb, and Woglog the Giant. No branch of science seems better adapted to this important purpose, than natural history.

The

The visible world presents a scene of novelty and delight, well calculated to engage the attention of the youthful mind, and forms, with a proper guide, the first lesson in natural religion; imprinting, in indelible characters, the existence of a Supreme First Cause, possessing the attributes of infinite wisdom, power, and goodness, and exciting admiration and gratitude. Children are charmed with the frolicksome motions of animals, the fine forms and beautiful colours of vegetables, the appearance of the sky and of the ocean; it is, therefore, desirable to direct this taste to a more minute examination of particular classes of objects, as the only means of attaining real knowledge.

There are but few elementary works on these subjects, adapted to young readers,

readers, either from their high price, or their scientific manner, which is more likely to alarm than attract the inexperienced pupil.

The success of my "Familiar Introduction to Botany," has induced me to attempt one on a similar plan, on the pleasing science of Entomology. Believing insects to be quite as interesting as flowers, I flatter myself it will receive the same indulgence as its precursor, and be equally acceptable to my juvenile friends. It remains to say, that my acknowledgments are due to Dr. Shaw and Mr. Barbut, as the principal sources from which I have collected my materials.

PRISCILLA WAKEFIELD.

INDEX

ERRATA.

Page. Line.

12—20, *after* also, *insert* generally.

16—25, for *scorpis*, read *scorpio*.

24—18, for *transitions*, read *transition*.

32—17, for *atidicus*, read *fatidicus*.

41—13, *after* except, *insert* the.

55— 8, for *species*, read *genera*.

60— 2, for *weather*, read *climates*.

78—10, for *Iroës*, read *Troës*.

147—24, for *belicosus*, read *bellicosus*.

165—10, for *require*, read *acquire*.

INDEX TO ENTOMOLOGY.

		Page.
1st. Order, COLEOPTERA		27
Genera.	Page.	
1st. <i>Scarabæus</i>	27	
<i>Hercules</i>	28	
<i>Goliath</i>	<i>ib.</i>	
Rose-chafer ..	<i>ib.</i>	
Dung-beetle ..	29	
Cockchafer	<i>ib.</i>	
2d. <i>Lucanus</i>	30	
Stag-beetle	<i>ib.</i>	
3d. <i>Dermestes</i>	31	
-----lardarius	<i>ib.</i>	
4th. <i>Ptinus</i>	<i>ib.</i>	
-----pectini-		
cornis	32	
-----pertinax	<i>ib.</i>	
-----fatidicus	<i>ib.</i>	
5th. <i>Hister</i>	33	
6th. <i>Gyrinus</i>	<i>ib.</i>	
-----natator	<i>ib.</i>	
7th. <i>Pausus</i>	34	
8th. <i>Byrrhus</i>	<i>ib.</i>	
9th. <i>Silpha</i>	<i>ib.</i>	
10th. <i>Cassida</i>	35	
11th. <i>Coccinella</i>	<i>ib.</i>	
Lady-bird ..	<i>ib.</i>	
12th. <i>Chrysomela</i>	37	
-----poplar	38	
13th. <i>Hispa</i>	<i>ib.</i>	
14th. <i>Bruchus</i>	<i>ib.</i>	
15th. <i>Curculio</i>	<i>ib.</i>	
Nut-weevil ..	39	
Corn-weevil ..	<i>ib.</i>	
Palm-weevil ..	40	
<i>Curculio Imperialis, or Diamond-beetle</i>	40	
-----regalis	<i>ib.</i>	
-----argen-		
tatus	41	
16th. <i>Attelabus</i>	41	
17th. <i>Cerambyx</i>	<i>ib.</i>	
-----longi-		
manus	<i>ib.</i>	
<i>Cerambyx da-</i>		
micornis ...	<i>ib.</i>	
Musk-beetle ..	<i>ib.</i>	
18th. <i>Leptura</i>	42	
-----arcuata	<i>ib.</i>	
19th. <i>Necydalis</i>	<i>ib.</i>	
-----cœru-		
lea	<i>ib.</i>	
20th. <i>Lampyris</i>	<i>ib.</i>	
Glow-worm ..	<i>ib.</i>	
21st. <i>Cantharis</i>	44	
-----bipus-		
tulata	<i>ib.</i>	
22d. <i>Elater</i>	<i>ib.</i>	
-----noctilu-		
cus	45	
-----obscurus	<i>ib.</i>	
23d. <i>Cicindela</i>	<i>ib.</i>	
-----cam-		
pestris	<i>ib.</i>	
24th. <i>Buprestis</i>	46	
-----gigan-		
tea	<i>ib.</i>	
25th. <i>Dytiscus</i>	48	
-----margi-		
nalis	<i>ib.</i>	
26th. <i>Hydrophilus</i> ..	49	
-----pi-		
ceus	<i>ib.</i>	
27th. <i>Carabus</i>	50	
-----crepi-		
tans	<i>ib.</i>	
28th. <i>Tenebrio</i>	<i>ib.</i>	
-----molitor	<i>b.</i>	
29th. <i>Meloe</i>		

	Page.		Page.
29th. <i>Meloe</i>	50	31st. <i>Staphylinus</i> ...	<i>ib.</i>
— proscara-		— ma-	
bæus	51	jor	52
Spanish-fly ...	<i>ib.</i>	32d. <i>Forficula</i>	<i>ib.</i>
30th. <i>Mordella</i>	<i>ib.</i>		

2d. Order, HEMIPTERA 55

Genera.			
1st. <i>Blatta</i>	55	5th. <i>Cicada</i>	61
— gigantea .	<i>ib.</i>	— spumaria	63
Common Cock-		6th. <i>Notonecta</i>	<i>ib.</i>
roach	56	— glauca	<i>ib.</i>
2d. <i>Mantis</i>	<i>ib.</i>	7th. <i>Nepa</i>	65
— precaria	57	— cinerea ..	<i>ib.</i>
— gongy-		— linearis ..	66
lodes	<i>ib.</i>	8th. <i>Cimex</i>	<i>ib.</i>
— phasma	<i>ib.</i>	Bug	<i>ib.</i>
3d. <i>Gryllus</i>	58	9th. <i>Aphis</i>	67
Grasshopper .	<i>ib.</i>	10th. <i>Chermes</i>	69
<i>Gryllus gryllo-</i>		— alni ..	70
talpa	<i>ib.</i>	— of the	
Locust	59	fir-tree	<i>ib.</i>
<i>Gryllus crista-</i>		11th. <i>Coccus</i>	71
tus	60	Cochineal	<i>ib.</i>
4th. <i>Fulgora</i>	61	Kermes	73
— lanter-		<i>Coccus Polonicus</i>	<i>ib.</i>
naria	<i>ib.</i>	12th. <i>Thrips</i>	<i>ib.</i>
		— physapus	<i>ib.</i>

3rd. Order, LEPIDOPTERA 75

Butterfly Sphinx, Moth.....	76
-----------------------------	----

4th. Order, NEUROPTERA..... 88

Genera.			
1st. <i>Libellula</i>	88	4th. <i>Hemerobius</i>	94
Dragon Fly .	<i>ib.</i>	— perla	<i>ib.</i>
<i>Libellula Lu-</i>		5th. <i>Myrmeleon</i> , or	
cretia	90	Ant-eater	95
2d. <i>Ephemera</i>	91	6th. <i>Panorpa</i>	97
May-fly	92	Scorpion-fly .	<i>ib.</i>
3d. <i>Phryganea</i>	<i>ib.</i>	7th. <i>Raphidia</i>	<i>ib.</i>
— grandis	94	— ophi-	
		opsis	

5th. Order,

	Page.
5th. Order. HYMENOPTERA.....	99
Genera.	
1st. <i>Cynips</i> , or Gall-fly	99
<i>Cynips quercus</i>	100
<i>Cynips rosæ</i> ...	<i>ib.</i>
2d. <i>Tenthredo</i>	101
Turnip-fly ...	102
<i>Tenthredo</i>	
<i>lutea</i>	103
3d. <i>Sirex</i>	<i>ib.</i>
— <i>gigas</i>	<i>ib.</i>
4th. <i>Ichneumon</i>	104
5th. <i>Sphex</i>	105
— <i>figulus</i> ..	106
6th. <i>Chrysis</i>	107
— <i>ignitis</i> ..	<i>ib.</i>
7th. <i>Vespa</i>	<i>ib.</i>
— <i>crabro</i> ..	109
8th. <i>Apis</i>	110
9th. <i>Formica</i>	121
10th. <i>Mutilla</i>	124

6th. Order, DIPTERA 124

Genera.		<i>Tabanus pluvi-</i>
1st. <i>Oestrus</i> , Gad-fly	124	<i>alis</i>
2d. <i>Tipula</i>	130	5th. <i>Culex</i> , Gnat....
— <i>rivosa</i> ..	<i>ib.</i>	Musquito
— <i>crocata</i>	131	6th. <i>Empis</i>
— <i>phalæ-</i>		— <i>livida</i> ..
<i>noides</i>	<i>ib.</i>	7th. <i>Conops</i>
3d. <i>Musca</i>	132	— <i>calcitrans</i>
— <i>cameleon</i>	<i>ib.</i>	8th. <i>Asilus</i>
— <i>vermileo</i>	133	9th. <i>Bombilius</i>
— <i>tenax</i> ..	<i>ib.</i>	10th. <i>Hippobosca</i> ...
— <i>pendula</i>	134	— <i>equina</i> ..
Blow-fly	<i>ib.</i>	— <i>avicu-</i>
4th. <i>Tabanus</i>	135	<i>laria</i>
— <i>bovinus</i>	<i>ib.</i>	Sheep-tick

7th. Order, APTERA 141

Genera.		<i>Acarus coleop-</i>
1st. <i>Lepisma</i>	141	<i>tratorium</i> ...
— <i>polypus</i>	142	— <i>vegetans</i>
2d. <i>Podura</i>	<i>ib.</i>	Cheese-mite ..
— <i>aquatica</i>	<i>ib.</i>	7th. <i>Hydrachna</i>
3d. <i>Termes</i>	143	— <i>geo-</i>
— <i>pulsato-</i>		<i>graphica</i>
<i>rius</i>	152	8th. <i>Phalangium</i> ...
4th. <i>Pediculus</i>	153	— <i>reni-</i>
5th. <i>Culex</i>	154	<i>form</i>
6th. <i>Acarus</i>	155	Shepherd Spi-
— <i>autum-</i>		der & Harvest
<i>nalis</i>	156	Man.....
		9th. <i>Aranea</i>

	Page.		Page.
9th. <i>Aranea</i>	159	12th. <i>Monoculus</i>	167
— diadema	<i>ib.</i>	— poly-	
<i>Tarantula</i>	160	phemus	<i>ib.</i>
<i>Aranea aquatica</i>	<i>ib.</i>	— pulex	168
— subter-		13th. <i>Oniscus</i>	169
ranea	161	— armadillo	<i>ib.</i>
— avicula-		— aquatica	<i>ib.</i>
ria	<i>ib.</i>	14th. <i>Scolopendra</i>	<i>ib.</i>
10th. <i>Scorpion</i>	164	— for-	
11th. <i>Cancer</i>	165	ficala	170
— Bernar-		— elec-	
dus	166	trica....	<i>ib.</i>
Land Crab ...	<i>ib.</i>	15th. <i>Julus</i>	<i>ib.</i>
Lobster	167	— sabulosus..	171

AN
INTRODUCTION
TO
ENTOMOLOGY.

LETTER I.

FROM FELICIA TO CONSTANCE.

Shrubbery.

DEAR CONSTANCE,

NOTHING but the restoration of your health, could reconcile the prospect of our passing another summer separated from each other. I had fondly promised myself the pleasure of participating with you in all my pursuits, and had planned many agreeable schemes, none of which can afford me any gratification alone. What is a walk, without a companion? or a book, unless there is a friend to converse with on its contents? In short, it requires the approbation or kind censure of a person one loves, to give a zest to every employment. You were this friend, this censor

to me: now you are gone, whatever I do is flat, tasteless, and solitary. My mother says, the best remedy for the loss of your company, is, to establish a regular correspondence on some particular subject, in which both feel an equal interest; and, as we derived so much amusement and advantage, last summer, from the study of Botany, she recommends our continuing that, combined with one still more interesting, because it treats of animated beings; I mean *Entomology*, or *the knowledge of Insects*, a pursuit of which she is extremely fond, and has kindly offered to give me lessons, that I am to communicate to you. I know you will approve this proposal; for, though some inattentive observers have despised the science as trifling and useless, they have exposed their ignorance by such an opinion. Surely, nothing can be more suited to a creature endowed with reason, than to investigate the works of God. Whether he turn his attention to the harmonious order of the vast orbs, which are scattered so magnificently through the boundless space; or examine the curious structure of an insect, so minute that it can only be perceived by the assistance of a microscope;—he will find the same wisdom and power, though differently applied, displayed in both. The admirable contrivance exerted
in

in the formation of every class of created objects, is not to be measured by the magnitude of the thing, but by the harmony of the design with the purpose it is intended to produce. Viewed in this light, the sting of a bee, the wing of a gnat, or the proboscis of a butterfly, call forth as much admiration as the trunk of an elephant. Nor does the formation of the minute parts of Nature, show less power in the artist, than those that astonish by their greatness. The wonders of a world, or the curious mechanism of a common fly, are equally beyond the capability of any being to produce, but that Supreme Intelligence who created the universe. Some naturalists consider insects as the least perfect class of animals, because many of them can live a long time after losing those organs that are essential to the existence of the nobler creatures. A caterpillar, for example, will live when its heart and lungs have been entirely eaten away. If we admit them to be inferior, it seems to consist rather in the narrow limits of their intellectual faculties, than in their conformation, which, like that of all other creatures, discovers such perfection of design, that it is impossible to say in what class of animals it is most conspicuous. The instincts of bees, ants, wasps, and probably of all the other tribes of insects, were we better

acquainted with them, are complete in their kind: they cannot err: they are compelled, by an irresistible impulse, to move without deviation, in one regular course of action: beyond this, they know nothing; neither have they, like the larger animals, the capacity of communicating with man. An elephant, a horse, or a dog, understands the signs of its master, and, by patient instruction, may be rendered almost rational; but what pains would instruct a butterfly, or teach it to change its habits? If they are taken out of their usual situation, they are entirely at a loss, and know not how to extricate themselves from the difficulty; whereas, we know that, in many instances, beasts and birds accommodate themselves to circumstances, which marks discrimination and superiority of intellect. Others, void of reflection, regard the numerous tribes of insects as of no use, but as ornaments in the creation; but every class of beings has its appointed office, and conduces to the harmony of the whole.

Insects are of essential benefit to man in several ways. Bees prepare the most balsamic conserve from the juices of flowers, which, without their intervention, would be of no value; we likewise owe to their labours the wax that supplies us with candles, and answers
many

many other purposes. The cochineal yields the finest scarlet dye, and the silk-worm converts the leaves of the mulberry-tree into silk. The termes, the flesh-fly, and many other insects, are employed in consuming substances that are falling to decay, such as rotten timber, putrid carcasses, &c. and though their task is less pleasing than that of the bee or the silk-worm, it is not less important; for the effluvia from such substances in warm climates, would produce a pestilence, and render the country uninhabitable. But there is another and an awful office to which these tiny and apparently feeble creatures are appointed, which is that of destruction. A swarm of locusts, extending over a whole country, and consuming every green thing, is as tremendous an instrument in the hands of Omnipotence, as an earthquake or a volcano. We may remember, that innumerable swarms of flies were sent to the Egyptians, as one of the signals of divine displeasure, and seem to have been as distressing as most of the other plagues. Dr. Darwin asserts, that the aphis, which is a small insect, commonly called the plant-louse, is so prolific and so voracious, that, were its numbers not checked by various enemies, which restrain its increase within due bounds, it would starve the whole race of mankind. So you may perceive,
that

that, though singly, they appear minute, and, as an enemy, contemptible, they are in reality very formidable from their numbers. Thus, some are employed in preparing, some in purifying, and others in destroying the materials on which they work. Their usefulness is also very important in preserving a due proportion among plants, in consuming what is dead or decayed, and in yielding a large supply of food to other animals; birds and fishes especially, of which they are the constant prey.

To those who love to indulge their taste with the view of the most luxurious and elegant objects, this branch of natural history will afford the most unlimited gratification, from the infinite variety of form and colour, excelled in richness and beauty by no part of nature, not even by the gay tribes of our favourite flowers.

The number of insects is prodigious, and the far greater part of them cannot be seen distinctly, without the help of a microscope. Unlike other animals which inhabit a single element, air, earth, and water, teem with them: the same insect, in different stages of its existence, is at one time an inhabitant of the water, and at another of the air. The changes these creatures undergo, are a source of great variety; for many of them assume several appearances, extremely different from one another, in the course

course of their short lives, and successively adopt habits suited to their new state of being. In some species the male differs greatly from the female, which is another cause of variety.

From these general observations, you will agree with me, my dear sister, that a fund of entertainment may be expected from the study of insects, and that it is well calculated to enlarge our ideas of the wisdom and goodness of the mighty Author of Nature.

Get your pencils and paints in order; for you will find great amusement, and considerable advantage, from copying the subjects I describe. As I intend to do the same, when we meet we may compare our drawing-books together, and correct each other's mistakes. Adieu, till next week, when I shall resume the pen, and again assure you, that I am your affectionate sister,

FELICIA.

LETTER II.

*FELICIA TO CONSTANCE.**Shrubbery.*

DEAR CONSTANCE,

BEFORE I enter into particulars, it will be necessary to point out those peculiarities that distinguish insects from all other animals. Linnæus has divided the animal kingdom into six classes, and comprised insects in the fifth, with this single definition: "Having two antennæ, or feelers," which are the horns affixed to the head. But some naturalists go further, and describe them by the following marks: They are furnished with several feet, not less than six; and are destitute of bones, the want of which is supplied by the hardness of the outer skin, that, like a coat of mail, serves at once the double purpose of defence and support.

Instead of breathing, as other animals do, by the lungs, they are furnished with pores, or breathing holes, called spiracula, placed along the sides of their bodies, through which they respire. After showing you what they have, I must enumerate what they have not: they have

have no red blood, no brains, no nostrils, no ears nor eye-lids.

It is reasonable to suppose, that with organs so different, their senses also differ materially from those of the larger animals. Some naturalists suppose that they have not the sense of hearing; but Mr. Barbut, who is an attentive observer, is of a contrary opinion, and relates a curious anecdote in support of his theory. He observed a large spider in St. James's Park, which had its web on one of the rails, at a considerable distance from the place where a great fly was entangled. Notwithstanding the situation of the two insects was such that the spider could not see the fly, he perceived the victim the moment he entered the snare, repaired to the spot, and disabled him from escaping; which he attributes to the sense of hearing. But, as I think it possible that the approach of the fly was made known to the spider by the vibration of the thread, as well as by its tones of distress, I am more convinced of the fact by his inference, that, since it is well known that many insects have the power of uttering sounds, as the large beetle, the bee, the wasp, the gnat, and the fly, we cannot suppose that this power is given without a corresponding capacity in their fellows to understand their meaning. It is undoubtedly the language of their kind, ex-

B 5

pressing.

pressing pleasure or pain, and understood by their companions, as is shown by numbers of bees, or wasps, flying to the assistance of a brother in distress, which has been attacked near the hive. Since they have no ears, Mr. Barbut conjectures that the antennæ are the seat of hearing, both from their situation on the head, and their hollowness, which fits them for the conveyance of sounds. If he is right, it is worth remarking, that, in other animals the organ of hearing is open, in these it is not so ; which is an admirable precaution to preserve these tender, flexible tubes from being clogged with dust, to which insects are peculiarly liable. After all that has been said, it is not improbable that these creatures, so essentially different from any other class of animated beings, possess senses of which we have no idea, and that the antennæ are the organs by which one of these senses is enjoyed. For whatever purpose they are designed, they vary in form, size, and number, according to the wants of the animal. They are always jointed; and those which belong to insects that live chiefly in the water, are shorter than those of such as live on the land, or soar in the air; the latter of which often have them very long and slender. Being hollow and jointed, they are easily bent in any direction, and appear to be exquisitely tender when

when injured. I have already said that their forms are various in different tribes, and for that reason they have been thought the most convenient parts for distinguishing the genera and species of insects; it is therefore necessary to acquaint you with their differences, which I will do as concisely as I can.

Antennæ setaceæ, tapering towards the end.

Antennæ filiformes, of an equal thickness, like a thread.

Antennæ moniliformes, resembling a row of beads.

Antennæ clavatæ, club-shaped, ending in a knob.

Antennæ fissiles, the thick end divided into several parts.

Antennæ pectinatæ, feathered along the edge, like the teeth of a comb.

Antennæ barbatæ, bearded with fine hairs.

Antennæ perfoliatæ, having joints of a flat, circular shape, threaded, as it were, by the body of the antennæ.

Besides the antennæ, insects are furnished with palpi, or feelers, which are also jointed, and are fixed to the mouth: they are generally four or six in number, and seem to serve the insect instead of hands, to bring the food to the mouth,

mouth, and hold it whilst eating. Mr. Barbut supposes they are the organs of smell, because they are always in motion; the insect thrusting them continually into every soft substance that lies in its way, apparently to examine whether it be proper for food. It is possible they may be furnished with nerves, like the snout of the hog, or the bill of the duck, for the same purpose. In the form and disposition of the mouth, Nature has displayed great variety; it is mostly placed in the lower part of the head, sometimes in the breast: in the beetle tribe, and others, it has very strong jaws, often notched on the inner side, somewhat like teeth. In some, the mouth consists of a tube, or instrument for suction, sometimes sheathed and guarded by different kinds of appendages. It is remarkable that the jaws of insects do not meet, like those of quadrupeds and birds, crosswise, but lengthwise. They have also a tongue and palate. But many insects have no tongue, nor do they utter any sound from their mouth: for this purpose some use their feet, others their wings, and others some elastic instrument peculiar to their kind.

The most curious and surprising part of insects is their eyes, which, in the same creature, are often of several kinds. Besides the two eyes placed on each side of the head, which
deserve

deserve a particular description, many insects have three small, round, brilliant globules on the crown of the head, called *stemmata*. The eyes of most insects, instead of being single, are composed of a prodigious number of little hemispheres, or round protuberances, placed with the utmost regularity and exactness, in lines crossing each other like lattice work: this group is supposed to be a collection of eyes. What wonders does the microscope enable us to behold! My mother has shown me the figure of a candle, multiplied almost to infinity, on the surfaces of one of these clusters of eyes; the beams of light shifting from eye to eye, according as I moved the candle. Whilst other creatures are obliged to turn their eyes towards the objects they wish to see, these have always some or other of their eyes so directed, as to take in the surrounding objects on whichever side they present themselves. Each of these individual eyes has a minute, transparent lens and pupil, through which things appear inverted, as in the human eye, and, when properly placed, serves the office of a telescope, by bringing distant objects to the sight. Mr. Leuwenhoek, a celebrated naturalist, looked through the eye of an insect, by the assistance of a microscope, and viewed the steeple of a church, which was 299 feet high, and 750 feet from

from the place where he stood; yet he discerned the steeple plainly, though it did not appear bigger than the point of a large needle. He afterwards turned his minute telescope, for so it may justly be called, towards a house, and clearly distinguished the doors and windows, and whether they were open or shut. The same gentleman reckons, in the two eyes of a dragon-fly, 25088 of these minute hemispheres. The pictures of objects seen through these eyes, must be millions of times smaller than those of the same objects painted on the retina of the human eye. There is no doubt that insects, too small to be clearly seen without a microscope, have eyes contrived to discern objects many thousand times less than themselves; for so the particles of their food must certainly be. Such calculations almost exceed the power of imagination, and are a convincing proof that the exquisite harmony of creation is as visible in the minute, as in the vast objects that surround us.

A fly is the spider's natural prey, and is remarkably cautious and nimble, and frequently comes from above; it was therefore necessary that the spider should have a quick sight, and the ability of looking upwards, forwards, and sideways, at the same time, especially as she has no neck, and her head is fixed.

fixed. Accordingly, she is furnished with eight eyes, curiously adapted, by their situation, to the wants of the animal; two being fixed on the top of the head, that look upwards; two in front, to look forwards; and on each side another pair, one of each points sideways forwards, and the other sideways backwards, so that the insect can see nearly round. The tongues of insects vary in form; that of a gnat pierces like a needle, and sucks like a pump, which fits it for drawing blood; whilst those of the butterfly tribes are curled up like the spring of a watch, which the insect can uncurl when it wishes to suck the honey from the bottom of a flower: in some others it is fleshy, but in the fly it is shaped like a tube.

I will now dismiss the head, with its appendages, and proceed to a description of the body, which, in the major part of insects, is divided into the thorax, or upper part, and the abdomen, or lower part. In many of the beetle tribe, the back of the thorax is distinguished by a triangular piece, called the *scutellum*, or escutcheon, situated towards the lower part of the thorax, and is extended between the wings. The under part of the thorax is termed the *pectus*, or breast, in which a longitudinal line, often pointed at both extremities, called the *sternum*, is placed. The abdomen is composed of rings,
having

having the *spiracula*, or breathing holes, in them, and the last terminates in the tail.

The members which adhere to the thorax and the abdomen, are the sting, the legs, the halteres, the pectines, and the wings.

The sting is a curious instrument, by which some of them inflict a painful wound, as I suppose you have experienced. It consists of two valves, from whence the creature puts forth a rigid bristle, that conveys a very subtle poison.

The legs are generally six; but mites, spiders, scorpions, and crabs, have eight, and some others have many more. The first joint is called *femur*, or thigh; the second, *tibia*, or leg; and the third, *tarsus*, or foot; which commonly consists of several small joints, terminating in two hooked claws that form the foot.

The *halteres* resemble two minute bladders, fixed on a short footstalk, and are situated, one under each wing: these poisers, as they are often called, are only to be found in the two-winged insects, and are supposed to serve as balances, to keep the fly steady.

The use of the *pectines* is unknown: they are peculiar to the genus *scorpis*, the species of which are distinguished by the number of teeth on each pecten. They are placed one on each side, between the breast and the abdomen.

The

The same variety is observable in the wings of insects, as in the other parts; but as Linnaeus has founded the orders upon their distinctions, and my letter is already extended to a great length, I shall defer a particular account of them till I write again.

Adieu, dear Constance: learn the lesson I have given you well, and be assured, I am always your very affectionate

FELICIA.

LETTER.

LETTER III.

*FELICIA TO CONSTANCE.**Shrubbery.*

DEAR CONSTANCE,

AS insects are endowed with the various powers of creeping, flying, and swimming, there is scarcely any place where they are not to be found:—earth, air, water, and the bodies of the larger animals, teem with them. Until a regular system was invented, their numbers and minuteness presented such inextricable confusion, as to discourage common industry from the pursuit. The difference of their outward appearance first reduced them into certain divisions, or classes: thus, the early entomologists grouped them into the obvious families of beetles, butterflies, and flies; whilst those of the same class that had four wings, they called bees. No advance was made beyond these general terms, till the immortal Linnaeus undertook to reduce the science to a systematic form. He was the man who first instituted natural orders, arranged them in genera by expressive names, and determined a

vast

vast number of species. He collected, with incredible pains, the synonymous names of the various authors who had written on the subject, and, above all, added descriptions, and the places where they were to be found. So great were the effects of this union of talents and industry, that he increased the number of known insects from two hundred to nearly three thousand, though this number is not the sixth part of those now known. This vast multitude is included in seven orders.

ORDER I.

Coleoptera.—This division contains all those insects whose wings are guarded by a pair of strong, horny cases, under which the wings are folded when at rest. These cases are called *elytra*. The beetle is an example of this order.

ORDER II.

Hemiptera, or half winged.—The upper part of the wing-sheaths in this tribe is of a leathery texture, and the lower part a sort of membrane. The sheaths of this order cross each other when closed, instead of meeting in a direct line, as in the *coleoptera*. It comprises all the locusts, or grasshoppers, with many others.

ORDER

ORDER III.

Lepidoptera, or scaly-winged.—It consists of butterflies and moths. The powder on the wings of these insects has been said to consist of small feathers; but more accurate observation shows that they are minute scales, of various shapes and sizes in the different species, and even in the different parts of the same insect. The prevailing shape, however, is that of a fan, and they are ranged one over the other, like the tiles of a house.

ORDER IV.

Neuroptera, or nerve-winged.—The insects of this class are remarkable for the strength of their wings, which resemble a net-work of fine wire. They are always four in number. The order is beautifully exemplified in the *libellulæ*, or dragon-flies.

ORDER V.

Hymenoptera.—It consists of insects furnished with four membranaceous wings, and also with a sting, or something resembling one. Take the wasp and the bee for examples.

ORDER VI.

Diptera.—It contains those insects that have
two

two wings only. In this order ranks the common fly, the gnat, and many others.

ORDER VII.

Aptera.—It consists of such insects as are entirely destitute of wings; as spiders, centipedes, fleas, and many others.

Lest you should be led into an error in the beginning of your career, I must inform you of a few deviations from these general rules. Some of the coleopterous insects have no other wings than the horny sheaths called elytra: and there are a few species, in which one sex is winged, and the other without wings; but they must not, on that account, be referred to the seventh order.

From the multitudes of insects that swarm in almost every situation, the ancients adopted the absurd opinion that they were nourished, and brought into life, by the matter in which they are found: thus, they supposed that flesh bred maggots; and dirt, those loathsome insects that are seldom seen but in the retreats of poverty or sloth. The enlightened philosophy of the present day has discarded such an unfounded notion, and clearly shown that all animals derive their being from parents of a like nature as themselves. They adopted another error,
 confuted

confuted likewise by more attentive observation, which might partly be attributed to the want of the microscope: they affirmed that insects had no blood, because it is clear and watery, instead of red. But the circulation of the blood is very visible in spiders; and especially in the common bug, in which the vibrations and contractions of the arteries are to be plainly discerned.

Animals of a different nature have been confounded with insects, such as snails, several kinds of worms, &c. Those tiny creatures called animalcules, are by some erroneously classed with insects, but in reality belong to the very different tribe of *vermes*, or worm-like animals.

Insects are very short-lived: few of them survive a year, many do not live half that time, and the existence of some does not extend beyond a day. This law of their nature is not without exceptions: bees, some butterflies, and spiders, are said to live a considerable time.

Insects, like other animals, are generally of two sexes, male and female; but amongst such as live in communities, as ants, bees, &c. the greater number are of neither sex. These neuters, as they are called, are the slaves or labourers of the family; they build the cells, collect provisions, and perform the whole interior economy.

The

The most surprising circumstance in the history of insects, I have yet to relate. The same insect, at different periods of its existence, frequently undergoes several metamorphoses, and assumes forms so various, that it is impossible to be recognised by any person unacquainted with its transformations. You amused yourself, a few summers ago, with keeping silk-worms, and may remember, that from a very small, yellow egg, was hatched a small, black worm, which gradually increased to a worm of considerable size, and after casting off its skin three times, became of an elegant, transparent ash-colour, or pale grey: in this state it ceased to eat, and retiring into a corner, began to wrap itself in a covering of fine yellow silk, which proceeded from its mouth. Upon opening this egg-shaped cone of silk, what was your surprise, to behold something withinside like a brown bean, instead of the silk-worm; and in about a fortnight your astonishment was redoubled, on perceiving a beautiful white moth burst forth from the hollow shell of the brown bean. This process is a good specimen of the changes of other species.

These transformations are common to all insects, except those of the *aptera* class, and afford in the different kinds a curious variety
in

in colour, form, and circumstances. The egg is called the first state, and the insect that is hatched from it, whether caterpillar, worm, maggot, or grub, is denominated the *larva*; which signifies a mask, because in that state the perfect insect is concealed in another form. The third state corresponds with your brown bean, and is most properly expressed by the term *pupa*, from its fancied resemblance to a doll wrapped in swaddling clothes. It was formerly called the chrysalis, or aurelia; and is still distinguished by different names, as cod, cone, or nymph. The last change is into the perfect insect, frequently rising from a torpid, inanimate state, to soar in the air, and rove with painted wings from flower to flower. May not these changes be considered an emblem of the transitions of mortal men to a glorified existence in the mansions of bliss?

The larva of most insects is extremely voracious, but in the perfect state some eat nothing, others subsist on the juice of fruit or flowers, which they extract with a proboscis or a long tongue; this, when at rest, is curled up in a spiral form, like the spring of a watch. Various other food is eaten by different tribes, as we shall perceive in the progress of our examination of the properties of each. Variety appears to be a standing law of nature: the
eggs,

EXPLANATION OF THE PLATES.

PLATE I.

INSECTS.

1st. ORDER. COLEOPTERA.

- Fig.* 1. Hercules Beetle.
2. Cockchaffer.
3. Stag Beetle.
4. *Dermestes lardarius*.
5. *Dermestes pellio*.
6. Ditto, magnified.
7. Antennæ of ditto, magnified.
8. *Ptinus pectinicornis*.
9. Head of ditto, magnified.
10. Antennæ of ditto, magnified.
11. Wing of ditto, magnified.
12. Leg, &c. of ditto, magnified.
-

DIRECTIONS TO THE BINDER.

Plates 1, 2, 3, 4, to be folded to face their Explanations, and placed at the end of sheet B.

Plates 5, 6, 7, 8, at the end of sheet C.

Plates 9, 10, 11, 12, at the end of sheet F.



Plate 2.



PLATE II.

- Fig.* 1. *Hister unicolor*.
2. Ditto, under side.
3. *Gyrinus natator*, natural size.
4. Ditto, magnified.
5. Larva of ditto, magnified.
6. Head of ditto, magnified.
7. *Pausus sphæroceros*.
8. Ditto, magnified.
9. Head of ditto, magnified.
10. *Pausus microcephalus*.
11. Ditto, magnified.
12. Head of ditto, magnified.
13. *Byrrhus pillula*.
14. *Silpha Germanica*.
15. *Cassida virides*.
16. *Coccinella septempunctata*.
17. *Chrysomela populi*.
18. Larva of ditto.
19. Small British *Chrysomelæ*.
20. *Hispa atra*, natural size, and slightly magnified.
21. *Bruchus pisi*.
22. *Curculio nucum*, or Nut-weevil, and larva.

PLATE III.

- Fig.* 1. *Curculio imperialis*, natural size.
2. Ditto, magnified.
3. *Attelabus coryli*, natural size.
4. Ditto, magnified.
5. *Cerambyx damicornis*, larva.
6. *Cerambyx damicornis*.

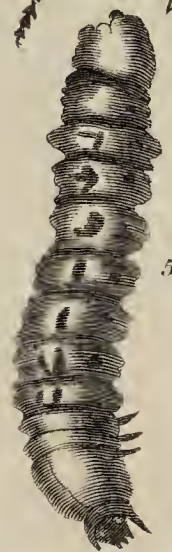


Plate 4.

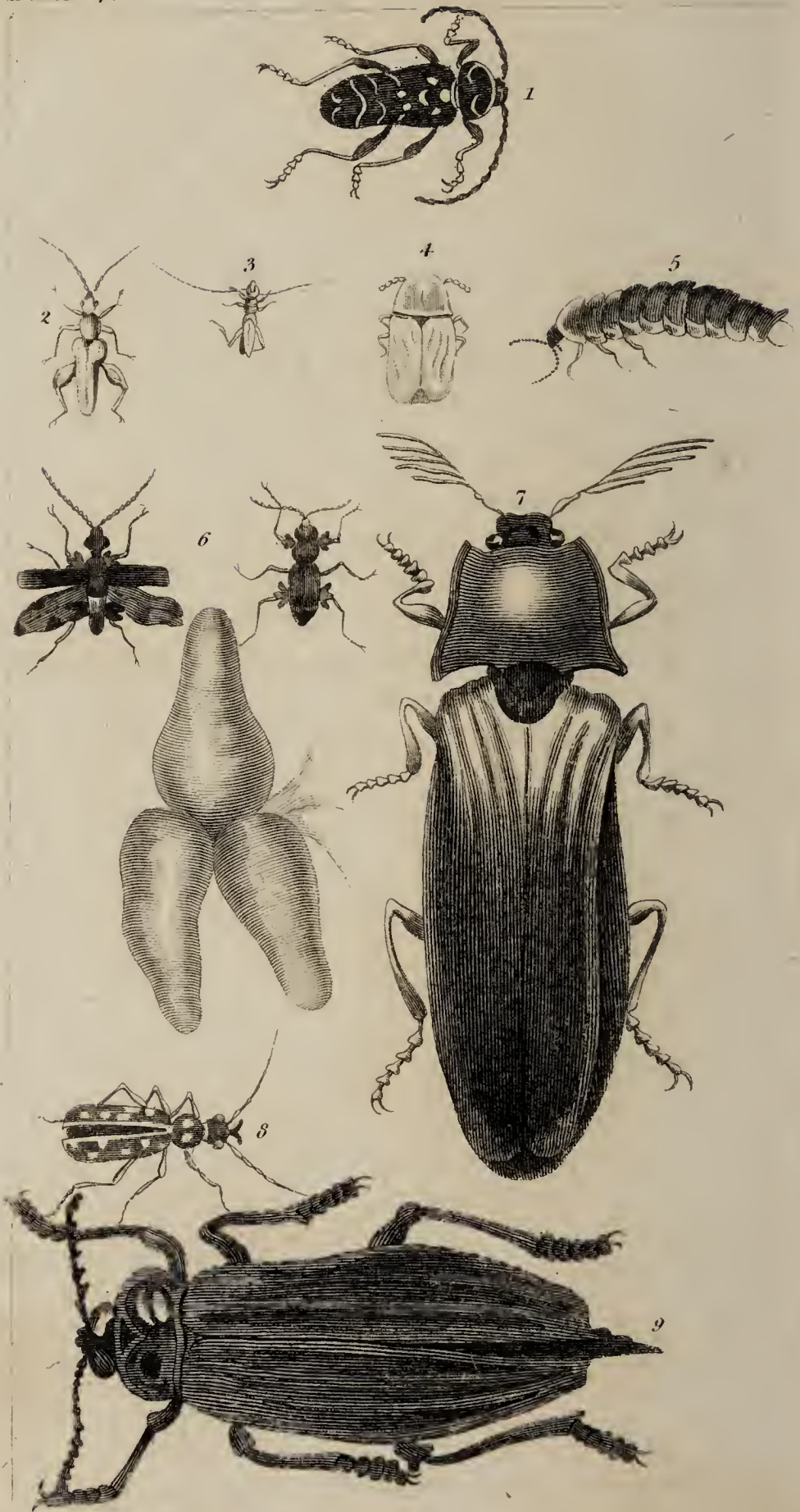


PLATE IV.

- Fig.* 1. *Leptura arcuata*.
2. *Necydalis cœrulea*.
3. *Necydalis umbellatarum*.
4. *Lampyris noctiluca*, male.
5. Ditto, female, or Common Glow-worm.
6. *Cantharis bipustulata*, with one of the triple
vesicles magnified.
7. *Elater flabellicornis*.
8. *Cicindela campestris*.
9. *Buprestis gigantea*.

eggs, the manner of disposing of them, the larvæ, the pupæ—differ as much in form and habits as the perfect insect. Thus, you see, my dear sister, what a wide field this pursuit opens to the gratification of our taste, and the exercise of our pencils; not to mention a benefit of a much higher nature, that of leading us to a more intimate knowledge of the exquisite wisdom and goodness of the great Creator, displayed as eminently in these minute objects, as in those stupendous effects of his omnipotence, that astonish the most careless beholder. Whatever part of His works lies within the reach of our comprehension, it presents the same proofs of beauty, order, and harmony. The organization of the smallest insect is suited in every member to the purpose for which it is designed; and, what is a further mark of divine goodness, contributes to the comfort and enjoyment of the animal: for all creatures seem formed for a degree of happiness, consistent with their nature; so that the gift of existence is a diffusion of enjoyment, and marks the benevolence of the source from whence it flows.

Beauty is a quality that often ensures kindness to its possessor; whilst, on the other hand, ugliness exposes its owner to contempt and ill-treatment. The variegated butterfly, dazzling the eye with its vivid colours, is an object

of fondness and admiration ; whilst the spider is stamped to death, without remorse or sympathy with its sufferings, merely because we attach an idea of deformity to its appearance, or from an affectation of aversion, which, in a sensible woman, is truly ridiculous. Some insects, I allow, must be destroyed ; but let it be done with the least pain and the greatest expedition possible. Children should be induced to show tenderness to every thing that breathes ; and if taught to admire, instead of being suffered to torment, insects that are within their reach, early lessons of humanity might be implanted, that would have a very beneficial effect on the character of the future man.

If you receive pleasure from my correspondence, I shall gladly resume the pen, and frequently repeat the assurance, that I am, most affectionately, yours,

FELICIA.

LETTER

LETTER IV.

*FELICIA TO CONSTANCE.**Shrubbery.*

DEAR SISTER,

HITHERTO my pen has been employed in pointing out the general characteristics of the insect tribes; but, in order to obtain that degree of knowledge, which shall render our walks interesting, by enabling us to recognise our acquaintance in the various inhabitants of every plant and shrub, I must descend to particulars, and introduce to your notice one individual at least of each genus, that, when you meet its congeners, you may not be at a loss where to place them, and may have a tolerably well-founded idea of their habits and manner of life, from their similarity to those with which you are better acquainted.

Recal to your remembrance the distinctions of the first order, COLEOPTERA, which are two wings, guarded by two horny cases, that meet together in a straight line. This order is extremely numerous. The first genus is called *Scarabæus*, or Beetle. The larvæ of the beetle

race mostly lead a solitary life underground; many of them feed upon dung, and delight to harbour in it. Some kinds, especially the garden beetle and the cockchafer, shelter themselves beneath the roots of plants, which they consume, to the great detriment of the florist.

The insects of warm climates exceed those of our temperate regions, in variety, number, size, and brilliancy of colours; therefore, I shall occasionally enrich my letters with an account of some of those which you will never see but in the collections of the curious.

The largest of this genus is called the Hercules, and is a native of South America. It sometimes measures not less than five or six inches in length. It is furnished with an enormous beak. The wing-shells are inclined to blue, marked with round, black spots; and the head and limbs are of a jet black.

The Goliath is an inhabitant of Africa, and is also of a great size. The thorax is of a rose-colour, striped with black; and the wing-sheaths are a purplish brown. The head is divided in front into two forked horns, and its limbs are very strong.

The gayest of our beetles is the Green or Rose Chafer, which you must have often seen on different flowers, particularly the rose and the peony, glowing like an emerald, with its
coat

coat of azure, green, and gold. The caterpillar is found in the hollows of old trees, and remains three years before it changes to a chrysalis.

The Dung Beetle has acquired the name of *Pilularius*, from living in the filthiest substances, and depositing its eggs in little pellets of excrement, that resemble pills.

The Cockchafer is so familiar to every child, that its figure needs no description, though it is likely that you are not so well acquainted with its habits. It is a very mischievous insect, both in its caterpillar and perfect state: in the former it lives in ploughed lands, and makes dreadful havock among the roots of grass and corn. The cockchafer has sometimes appeared in particular districts in such numerous swarms, as to strip the trees of their foliage, and threaten a famine; but in the wise arrangement of Nature, where an evil prevails, a remedy is provided to cure or mitigate it. This insect, whilst a grub, and after it gets its wings, is the prey of many species of birds, which thin their numbers, and in general prevent them from increasing beyond a due proportion. The larva is very small at first, and is two or three years in attaining its full size; when it undergoes its metamorphose to a chrysalis, in which state it remains till the succeeding

ing summer: it then emerges from its tomb, and after enjoying the pleasure of an improved existence for some time, lays its eggs in the ground, and dies.

The principal species of the second genus, *Lucanus*, is the Stag-Beetle, which is sometimes two inches and a half long, from the tip of the jaws to the end of the body. The general colour is a deep chesnut; but the jaws are sometimes as red as coral: those of the female are much shorter. There is a species of a smaller size, and one lately discovered in New Holland, of a beautiful golden green, with short toothed jaws, of a brilliant copper colour. The foreign species of this genus, are chiefly natives of America.

You must search for the larva of the Stag-beetle in the hollows of oaks, where they shelter themselves beneath the bark, and feed on the softest parts of the decayed wood. It is supposed, that it does not attain its full size in less than five years, when, by frequently turning itself, and moistening its skin with its glutinous saliva, it forms a smooth, oval hollow in the earth, in which it lies; after this, it remains about a month in a state of torpid tranquillity, slips off its skin, and becomes a chrysalis. The ball of earth thus formed, is larger than a hen's egg, rough on the outside, but

but highly polished within. The chrysalis lies about three months, before it gives birth to the complete insect, which feeds upon the liquor that oozes from the oak tree. In this operation, the peculiar conformation of the jaw is of essential use, as it enables its owner to strip off the bark, and fix itself on the branch whence it draws the juice. As we proceed, we shall perceive many similar instances of the harmony between the instruments of action, and the instincts of the animal.

The third genus is named *Dermestes*. This small insect is called the Leather-chafer, from the injury it occasions, in its larva state, to skins, furs, and other animal substances of a dry kind, upon which it preys with persevering destruction. To the collectors of stuffed birds, dried plants, &c. it is a terrible enemy, and can scarcely be destroyed but by arsenic.

The *Dermestes lardarius*, is about the third of an inch long. It is produced from the bacon-maggot, and when touched, instinct has taught it to conceal its head under its thorax, and its feet beneath the abdomen; remaining in that situation so long without motion, that a person unacquainted with its habits, would suppose it were dead.

The genus *Ptinus*, like the last, consists of small insects, the larvæ or maggots of which,

are

are found in the trunks of decayed trees, in old tables, chairs, &c. Some live and undergo their change among hay, dried leaves, collections of dried plants, and substances of a similar nature.

Ptinus pectinicornis is readily distinguished by its feathered antennæ. It is produced from a worm that is lodged in wood and the trunks of trees, especially the willow, where it makes deep, round holes, turns to a winged insect, takes flight, and rests upon flowers.

Ptinus pertinax has habits similar to his fellows. When caught, he draws back his head and legs, shams death, and will not move, even though pricked, unless compelled to it by heat.

Ptinus atidicus belongs to this genus, and though, from its brown colour and minute size, it often eludes the search, has been an object of terror to thousands, from their superstitious fears. Towards the latter end of spring, this little animal commences his alarm, which is only a call to his mate, made by beating on any hard substance, with the shield or fore-part of his head. This sound, so harmless in itself, is construed by the vulgar to be an omen of approaching dissolution. It is curious to observe, that it generally beats seven, nine, or eleven strokes, in pretty quick succession, repeating

peating them at uncertain intervals; and in old houses, where these insects are numerous, it may be heard, especially if the weather be warm, almost every hour of the day. You must not confound this insect, which is the real *Death-watch* of the common people, with a much smaller insect, of a very different genus, which makes a sound like the ticking of a watch, and continues it for a long time without intermission.

Fifth genus, *Hister*.

The insects belonging to this genus, as well as their larvæ, are mostly found about dung-hills. Their habits are either unknown, or not remarkable. They are small, of a coal black, and a flat shape.

Sixth genus, *Gyrinus*.

The *Gyrinus natator* is probably well known to you, under the name of the Water-Flea, forming circles on the surface of the water, by its very brisk motions. Its curious structure, so admirably adapted to its manner of life, is deserving your attention. The antennæ are short and stiff, appearing to consist of one undivided piece; but the microscope shows that they are composed of very numerous, close-set joints. The hinder legs are very broad, finely webbed with minute hairs, and most curiously formed for the purpose of fins.

or oars. In both the larva and complete state, it is an inhabitant of the water, and owes its safety to the briskness of its motions, as, on the least alarm, it dives beneath the surface, with astonishing celerity. The larva has a very long body, with a great many projections, like sharp-pointed fins, along its sides. Its head is armed with a pair of forceps, so formed as to enable it to suck the juices of the smaller water-insects, which are its prey. If you can catch it, a task not very easy to be performed, you will find it, from its transparency, a curious object for the microscope.

The genus *Pausus* is not included in the twelfth edition of the *Systema Naturæ*. The species hitherto discovered, are natives of Africa, and appear to be night insects, furnished with a knob at the end of each antenna, that emits a dim, phosphoric light, which probably serves as a lamp, to guide the insect in the dark.

The larvæ of the genus *Byrrhus*, are found upon plants, or in the bodies of half-decayed animals. They often undergo their transformations in insects that have been preserved, and reduce them to powder. The perfect insect has some resemblance to the lady-bird tribe.

The insects of the next genus, *Silpha*, are mostly found amongst substances in a state of decay,

decay ; frequenting dunghills, carrion, &c. and depositing their eggs chiefly in the latter, which, for greater security, they contrive to bury underground. Several of these insects have been seen working together, till they have accomplished the task of dragging under the surface the body of a mole, in the space of an hour, so that no trace of it was to be perceived.

The larvæ of the genus *Cassida*, or Helmet Beetle, eat the under side of the leaves of plants; frequenting, particularly, thistles; and those of the verticillated kinds, such as mint, &c. where they hide themselves under a cover of their own excrement, supported in the air above their bodies, by means of the two prongs at the extremity of the tail. When this artificial umbrella becomes too dry, they cast it off, and form a new one. It is very small, of an oval figure; the colour of its back bright green, and the under part coal black. Some of the foreign species are very beautiful.

Amongst the pretty insects of the next genus, *Coccinella*, you will discover your old favourites, that have so often amused us in our childish years—the gay tribe of Lady-Birds: some scarlet with black spots, others yellow with black, or black with red, or yellow with white spots, according to the species. Though

you

you are so well acquainted with the fly, perhaps you do not know that the larva and chrysalis are both of them likewise spotted with red or white, and that they are each of great service to mankind, by devouring vast numbers of the aphides; those troublesome, small, green insects, which infested our rose-trees last spring, and rendered them so unthriving.

Having drawn out my letter to so great a length, without advancing further than one-third of the first order, COLEOPTERA, I shall lay aside my pen for the present, and resume the subject at a future opportunity. Farewel, dear Constance, your

FELICIA.

LETTER

LETTER V.

*FELICIA TO CONSTANCE.**Shrubbery.*

DEAR CONSTANCE,

YOUR last letter fully recompensed me for any trouble I have taken to amuse you. My time has been well spent, if, as you say, the examination of flowers and insects enliven your walks, and render the exercise your health requires interesting and pleasant, which before was performed merely as a duty. My mother and I also sally forth, as soon as the breakfast-table is removed, to enjoy the freshness of the morning air, equipped with a microscope, and a little straw basket to contain our specimens. With this apparatus we proceed, shaking every plant and shrub, till we discover some object that arrests our attention, and rewards our search.

Willows, poplars, and birch-trees, yield us a rich harvest, in the different species of the beautiful race of insects called *Chrysomela*, which feed on the pulp of their leaves, but reject the fibres. That which is found on the
 poplar

poplar, is twice the size of a common lady-bird, and is bright red, with the tips of the wing-shells black, and a bluish hue on the under part: the larva is of a pale, yellowish green, speckled with black, and edged with rows of bristles, which, when the insect is handled, emit a disagreeable odour, by means of a white fluid that issues from a pore at the tip of each of them. The species of this genus are numerous, and richly adorned with the gayest colours. Several of them are natives of India and South America.

The next genus, *Hispa*, is rare, and singular in its appearance, bearing some resemblance to a hedgehog in miniature; it being a small, black insect, thickly beset with spines. You must look for it at the roots of grass.

The genus *Bruchus* is found upon pea-blossoms. Its colour is black, speckled with white: the two fore-legs are reddish, and the hind-legs are armed with a sort of tooth, the purpose of which does not seem to be known.

I must now introduce the genus *Curculio*, or Weevil, to your notice; a very numerous and destructive tribe. One of them is very familiar, though, I suppose, its habits are unknown to you. The next bunch of nuts that fall in your way, examine each nicely, and if there are any small holes in the shells, you may depend
on.

on it, the larva of the Nut-weevil has been at work. The perfect insect, early in August, hovers about nut-trees, for the purpose of providing a secure retreat for her future progeny. Directed by pure instinct, for it cannot be affection for objects she has never seen, she singles out a nut, which she pierces with her proboscis, and then, turning round, deposits an egg in the hole she has bored. She passes from one nut to another, providing, in the same manner, for her whole stock of eggs. The nut, apparently uninjured, continues to grow till the kernel is ripe. When the maggot is hatched, it feeds on the nut; which, by the time it is nearly consumed, falls to the ground, without hurting its inmate. When approaching its change, the maggot prepares for its escape by enlarging the hole previously made in the shell. As soon as it has emerged from its lurking place, it begins to burrow under the surface of the ground, where it lies dormant for eight months, and then, casting its skin, becomes a chrysalis; in which state it remains till August, when it assumes the form of a small, brown beetle, with a very long snout.

In a manner similar to that I have just described, the Weevil, properly so called, another species of the same genus, attacks the
grains

grains of corn, and produces very serious mischief.

Some of the foreign species are large and beautiful. The Palm-Weevil is entirely black, and above two inches long from the tip of the snout to the end of the body. The larva is also of considerable size: it feeds on the tender part of the smaller palm-trees, and is esteemed, by the inhabitants of the West Indies, one of their greatest dainties.

I cannot dismiss this genus without mentioning the *Curculio imperialis*, or Diamond Beetle. It is a native of Brazil: the ground colour of the wing-sheaths is coal-black, but they are beset with many rows of sparkling spots, of a gold green, which, when magnified, display the varying lustre of the most brilliant gems. This appearance is produced by innumerable minute scales, so polished and united, as to reflect the prismatic colours in this lively manner.

The *Curculio regalis* is found in New Holland, and nearly equals the preceding in beauty; the wing-shells being decorated with large, shining, golden spots, arising, likewise, from a vast number of scales of that colour. If you search the fields and gardens attentively, it is not unlikely, that, in the course of the summer, your toil will be rewarded by a sight
of

of the *Curculio argentatus*, a brilliant species of the same genus, and a native of our own island.

There is a great similarity between many of the succeeding genus, *Attelabus*, in both the perfect and larva states, and that I have just described. In their habits they are also much alike. Some of them feed on the hazel and the birch.

The next genus, *Cerambyx*, or Capricorn, is very extensive, containing many insects of the most extraordinary appearance, and exceeding, in size, any in the order COLEOPTERA, except genus *Scarabæus*.

The *Cerambyx longimanus* measures nearly three inches in length: the wing-shells are covered with a very fine down, and are elegantly varied with red, black, and yellow stripes: the fore-legs are very long, and barred with red.

The *Cerambyx damicornis* is a native of many parts of America and the West Indies; where its larva is considered one of their greatest delicacies. They are called Macaccos: and it is said that the entire employment of some negroes is to scoop these maggots out of the bodies of trees, in which they live, and feed upon the inner substance.

The Goat-chafer, or Musk Beetle, is one of
this

this genus, and takes its name from its powerful scent, resembling that of musk, ambergris, and roses. You may find it on the willow.

The genus *Leptura* bears great resemblance to that of *Cerambyx*, especially the larva, both in habits and appearance. Some of them are very beautiful. The *Leptura arcuata* is black, marked on the wing-sheath with bright yellow semi-circular bands. Some of the *Lepturæ* are found in Kent, in the bean and pea-fields, on currant-bushes, and on fern.

The genus *Necydalis*, Carrion-eater, is distinguished from the other insects of the first order, in having the wings extended their whole length, instead of being folded under the elytra.

Necydalis cœrulea is an elegant species: it is not above half an inch in length, and its colour is a light blue, sometimes inclining to green. It is found in woods during the summer months.

The genus *Lampyris*, Fire-fly or Glow-worm, is very interesting, on account of its luminous appearance in the dusk of evening. The *Lampyris noctiluca*, or Common Glow-worm, you may chance to have seen, sparkling like a diamond, on some dry, mossy bank or hedgeway. Brilliant as this insect (which, by the bye, is the female) appears in the darkness
of

of night, when examined by day-light, it is a little creature, about three quarters of an inch long, of a dull, earthy brown on the back, the under part tinged with rose colour: the two or three last joints of the body are of a pale sulphur, from whence the phosphoric light proceeds. The larva, pupa, and complete female insect, in their general appearance, differ but little from each other; but the luminous brightness is most striking in the last state, and is displayed or withheld at pleasure, being increased by the motion of the insect, and diminished, or obscured, by either unfolding or contracting the body. This curious property is given to the female glow-worm, which is destitute of wings, as a means of attracting the notice of the male, which is a flying insect, and, without this dazzling invitation, would be at a loss to discover its mate in the dark. Dr. Darwin alludes to this beautiful phenomenon, in the following lines, addressed to the Nymphs of Fire*.

“ You with light gas the lamps nocturnal feed,
That dance and glimmer o’er the marshy mead;
Shine round *Calendula* at twilight hours,
And tip with silver all her saffron flowers;
Warm, on her mossy couch, the radiant worm,
Guard from cold dews her love-illumin’d form:

* Botanic Garden.

From

From leaf to leaf conduct the virgin light,
 Star of the earth, and diamond of the night!

The genus *Cantharis* comprises a number of small insects, adorned with gay colours, depending greatly on sex, season, &c. so that a description of one of them will suffice. The *Cantharis bipustulata* is of a slender shape, and of a very dark, but elegant, gilded green, with the tips of the wing-shells red: on each side of the thorax, a little below the setting on of the wing-shells, lies a triple vessel, or bladder, which the insect can extend or draw in as it pleases. From inspecting this appendage with the microscope, an alternate inflation and contraction is perceptible, like the motion of the lungs in the larger animals, and probably is applicable to the same purpose. This insect frequents various plants, particularly the nettle. Most of the tribe are very voracious, some of them have been seen to prey on their own species.

The most striking peculiarity in the genus *Elater*, is a spine, situated in the under part of the thorax, so ordered, as to fit, when required, a small cavity in the upper part of the abdomen; forming a sort of spring, that enables the insect, if laid on its back, to leap to a considerable height. How nice is the mechanism

nism of Nature, to effect certain purposes! The species are numerous: many of them are natives of the tropics, and vastly exceed those of Europe in size. The most remarkable is the *Elater noctilucus*, called, in South America, Cocujas. It is about an inch and a half long, and of a brown colour, with a smooth, yellow, semi-transparent spot on each side of the thorax, diffusing such a brilliant phosphoric splendour, that a person may easily read the smallest print by its light: and, if eight or ten of the insects are put into a phial, they will give a light equal to that of a common candle. The larvæ of this genus injure the roots of grass. The Wire-worm, so destructive to corn, is supposed to be the larva of the *Elater obscurus*. *Cicindela*, or Sparkler, was the name used by ancient writers to designate the glow-worm, but is now applied to a different genus, the individuals of which have a strong, rapid flight, and are often seen on the wing, in the hottest part of a summer's day, in dry meadows, or on sandy banks. The *Cicindela campestris* is remarkably elegant, being of a bright green, with five small, round, white spots on the wing-shells; the head, thorax, and limbs, are of a rich golden cast, and the eyes black and prominent. Its larva is a long, soft, whitish worm, with a brown, scaly head.

head. This worm makes a perpendicular, round hole in the ground, keeping its head at the entrance, in order to catch the insects that chance to fall into the hole. These devouring tyrants of the insect world, will sometimes, by this stratagem, perforate a piece of ground in a surprising manner.

There are but few species of the genus *Buprestis*, or Cow-burner, seen in Europe; and they are very inferior in size and splendour to those of India and America, though some of them are elegantly adorned.

The *Buprestis gigantea* is a native of India, China, and South-America, and is distinguished for the glowing brilliancy of its colours, which are displayed to great advantage from the magnitude of the insect, which is two inches and a half in length. The thorax is like polished bell-metal, and the wing-cases of a gilded copper-colour, with a cast of bluish green, rendered more dazzling by ridges the length of the elytra. This splendid insect is produced from a large white larva, that is said to feed upon the roots of the convolvulus tribe of plants.

My letter is already so long, that I must defer the remainder of the Coleoptera order to another.

When I review the brilliant decorations of
the

the Buprestis, the sparkling of the Glow-worm, and the rich ornaments of the Diamond-beetle, with those of many others already described, besides anticipating the gay plumage of the Butterfly race, I am ready to apply to insects what was formerly said of the lily: "That, verily, Solomon, in all his glory, was not arrayed like one of these." When you are inclined to indulge vanity in dress, remember this.—Adieu. Your

FELICIA.

LETTER

LETTER VI.

*FELICIA TO CONSTANCE.**Shrubbery.*

DEAR SISTER,

TO those who are attentive observers of Nature, nothing is more beautiful than the admirable harmony conspicuous between the structure of plants and animals, and the purposes to which it is adapted.

The next genus, *Dytiscus*, Plunger or Diver, affords an instance of this harmony, they being water-insects, furnished with hind legs peculiarly adapted to swimming, tapering towards the point, and beset thickly on each side with fine, strong hairs, which serve the office of oars.

One of the largest European species is the *Dytiscus marginalis*, which is of a blackish olive colour, with the thorax and wing-sheaths bordered with yellow, and highly polished in every part, which secures it from wet. If you chance to walk by stagnant waters in a summer's evening, it is likely you will see this fly, as well as the larva that produces it; which

has



PLATE V.

- Fig.* 1. *Dytiscus marginalis*.
2. Larva of ditto.
3. *Hydrophilus piceus*.
4. Larva of ditto.
5. *Carabus thoracicus*.
6. *Tenebrio molitor*.
7. *Meloe*, head magnified.
8. *Meloe proscarabæus*, male.
9. Ditto, female.



Plate 6.



PLATE VI.

- Fig.* 1. *Mordella aculeata*.
2. Legs of ditto, magnified.
3. Antennæ of ditto, magnified.
4. *Staphylinus major*.
5. *Forficula auricularia*, or Earwig, magnified.
6. Young Earwig, and eggs.

PLATE VII.

2nd. ORDER. HEMIPTERA.

- Fig.* 1. *Blatta gigantea*.
2. *Blatta orientalis*.
3. *Mantis oratoria*, eggs, larvæ, &c.
4. *Mantis gongyloides*.
5. *Gryllus gryllotalpus*, or Mole Cricket.
6. *Gryllus cristatus*.





PLATE VIII.

- Fig.* 1. *Fulgora lanternaria*.
2. *Notonecta glauca*.
3. *Nepa cinerea*.
4. *Cimex domesticus*.
5. *Aphis rosæ*.
6. *Aphis mali*.
7. *Chermes buxi*.
8. Ditto, magnified.
9. *Coecus cacti*, natural size and magnified.
10. *Thrips physapus*, magnified.
11. Ditto, under side of the head magnified, to show the snout.
12. Foot of the *Thrips physapus*.

has a resemblance to a shrimp, and is of a most voracious disposition, devouring, indiscriminately, water-insects, tadpoles, newts, and even small fishes do not escape its ravages. When arrived at its full growth, it retires to the bank, and there forms a hollow of an oval shape, where, in a few days, it changes to a chrysalis of a whitish hue, which, in about three weeks, becomes a flying beetle.

The genus *Hydrophilus*, another aquatic race, bears a near resemblance to that of *Dytiscus*. The principal European species, *Hydrophilus piceus*, is of a singular form; the thorax being extended beneath, into a very long, sharp-pointed spine, and the hind legs fringed with fine, bristly hairs, that enable them to resist the water and act like oars. The larva of this insect has puzzled many naturalists, by the unusual appearance of its legs; which, from the position of the head, unless cautiously examined, seem to be inserted in the back, instead of the under part of the body. The female fly of this species differs from all other coleopterous insects, in spinning a flat, circular web, of a silky substance, as a repository for its eggs, which it leaves floating on the water; whence, as soon as the larvæ are hatched, they commit themselves to that ele-

D

ment,

ment, and immediately commence expert swimmers.

The genus *Carabus*, Bull-head, contains a vast number of species. As there is a great affinity between them, I shall confine myself to some account of the *Carabus crepitans*, a name it has received from a peculiar mode of defence bestowed upon it by nature. When attacked by any of its enemies, being the prey of a species of the larger *Carabi*, it discharges a bluish, foetid, penetrating vapour, with a smart explosion, ten or twenty times successively, which seldom fails to drive away those that would annoy it.

The genus *Tenebrio* has received the name of Darkling, from its gloomy habits of lurking in dark, damp cellars, and such neglected places; avoiding the light, and delighting in filth and putrefaction. Its colour accords with its disposition, being a coal black.

The Meal-worm, so often found in flour, is the larva of the *Tenebrio molitor*, and is the favourite food of the nightingale, when kept in confinement. The Tenebriones run swiftly, and emit an offensive effluvia, on which account they are often called Stinking Beetles.

Nature, various in all her productions, has endowed the genus *Meloe* with singular properties, of which I shall give an example in the

Meloe

Meloe proscarabæus, commonly called the Oil-beetle, from an oily fluid, of a fragrant smell, that, on handling the insect, exudes from it, and has been thought efficacious in rheumatic cases. This is a large beetle, of a very dark violet colour; the wing-sheaths oval, and so short, in the female especially, as scarcely to cover one-third of the body. Late in the spring, she is often seen in fields and pastures, creeping along, with her body so swoln with eggs, that she moves with difficulty. These eggs she deposits in a heap, beneath the surface of the ground; and, as soon as the larvæ are hatched, they are nourished by attaching themselves to other insects, and absorbing their juices. The Spanish Fly, used for blisters, belongs to this genus, and is extremely beautiful, being of the richest gilded green, with black antennæ.

There are but few species known of the next genus, *Mordella*, or Nibbler. They are small, black insects, endowed with the power of leaping to some distance, and are usually found on beds of flowers.

The genus *Staphylinus* contains numerous species of a voracious tribe, which are not satisfied with devouring every kind of insect inferior in strength, but often make their own species their prey. Their projecting jaws ac-

cord with their ferocious habit, and enable them to bite and tear; though, from a knack of turning up the tail, which is harmless, they appear as if preparing to defend themselves with a sting. The wings are large, and curiously folded under the elytra, which are small. When the insect is inclined to fly, he expands these delicate wings, and skims through the air with inconceivable lightness. Several of the small species are adorned with beautiful colours, but the largest of the British species, *Staphylinus major*, is a deep black, and is frequently seen in autumn, about sunny paths, in fields or gardens. Some of them inhabit cow-dung, or humid places, and are called Rove-beetles.

The genus *Forficula* presents you with an object of your detestation, the Common Earwig; though, before I dismiss it, I hope to convince you that your aversion rests on a false basis, and that, except the injury to which your flowers are exposed by its ravages, you have nothing to dread from this much persecuted insect, but a great deal to admire in its curious structure. The vulgar notion, of its entering the human ear, is rejected by men of science as absurd, and ranked amongst those opinions that have originated in ignorance, and been confirmed by prejudice.

The

The wings of the earwig are remarkably elegant, and lie in so many folds beneath their small sheaths, as to excite admiration. In proportion to the size of their owner, they are large and transparent; though probably few careless observers know that they have any, for they fly only by night, and it is difficult to make them open their wings in the day-time. Instinct has taught the female to seek some damp place for her eggs, equally secure from drought or heat. Nor does her maternal care stop here, as in most other insects, but when they are hatched she broods over her young, something like a hen over her chickens; the little ones clinging to her sides for several hours in the day. The larvæ are very small at first, and have a great resemblance to the parent insect, except being of a whitish colour, and not yet having the forceps at the end of the tail curved inwards. The earwig lives among flowers, and feeds upon decayed fruit and other vegetable substances, unless pressed by hunger, when it has been known to prey upon its own species.

Having brought you to the last genus of the first order, I shall conclude my letter, after earnestly recommending you to examine every object with the most diligent attention, that none of those minute parts, appropriated to particular

particular uses, and evincing the design and wisdom of the Creator, may escape your notice; for be persuaded, my dear Constance, that in studying the book of Nature, delightful as the employment is, amusement is by no means the sole, or even principal object; but rather that we may become better acquainted with the works of God, in the meanest of which, as well as the most magnificent, his wisdom and goodness are strikingly displayed. Farewell.
Your

FELICIA.

LETTER.

LETTER VII.

*FELICIA TO CONSTANCE.**Shrubbery.*

DEAR CONSTANCE,

LEST you should not recollect the characteristics of the second order, HEMIPTERA, I shall repeat them before I introduce to your notice the species that compose it. The wing-covers are of a leathery texture, like vellum; and cross each other, instead of meeting in a straight line.

The first genus, *Blatta*, Cockroach, presents a collection of very disagreeable, destructive insects, well known in kitchens and bake-houses, where they consume meal and dough. Though these creatures are disgusting and troublesome inmates in our own country, yet, by comparing them with some of the same genus in warm climates, we are taught to prize the advantages of our highly-favoured island, which is exempt from such grievous inconveniences.

The *Blatta gigantea* is the annoyance of many of the warmer parts of Asia, Africa, and
South

South America, where these offensive, voracious insects plunder and soil all kinds of food, whether drest or raw, and damage all sorts of clothes, leather, books, paper, &c. They fly into the faces of the inhabitants, and their legs being armed with a sharp spine, makes them very formidable. They swarm in old houses, dark corners, and other lurking places, where their noisome smell, and a loud rapping noise, by which they call their companions, disturbs so, that none but sound sleepers can rest in the apartments in which they have taken shelter.

The *Blatta orientalis*, or Common Black Cockroach, frequently called (improperly) Black Beetle, is supposed to have been imported from the Eastern parts of the world; a baneful gift, the effects of which are said to increase throughout the country.

The second genus in this order, is that of *Mantis*, called also Soothsayer, from the idea entertained by the vulgar, that it possesses supernatural powers. This notion has taken its rise from the peculiar manner of its holding the fore-legs when sitting, which superstition has construed into an act of prayer; so, that if a bewildered traveller applies to this insect for direction, they ignorantly suppose that he will be guided into the right path, according to which leg the animal first stretches out.

Whether,

Whether, from the same cause, a similar effect is produced on the minds of the Hottentôts, is difficult to ascertain; but they hold the *Mantis precaria* in such veneration, that they esteem themselves blessed if it alights upon them, and pay it a species of adoration.

The most vivid fancy can scarcely imagine forms more diverse or grotesque, than those of some of the species of this genus. That of the *Mantis gongylodes*, from its slender limbs, narrow body, and shrivelled wings, of a deadish green when dried, might be mistaken for a bunch of dead leaves, and this circumstance has obtained it the name of the Walking Leaf. This species is found in China, and the rest are all natives of foreign climes.

Specimens have been transmitted to Europe, of a genus called *Phasma*, not included in the Linnæan System, and differing from that of *Mantis* in some points, whilst in others it has a near resemblance to it. It differs in having all the legs equally adapted for walking, and in feeding entirely on vegetables; but agrees in its likeness to the stems and leaves of dried plants. Probably, when the insect is alive, the colour is a brighter green, and serves more effectually to deceive the birds that prey upon it. Several species are extremely large, measuring six or eight inches in length, and pos-

sessing an additional security in the numerous spines with which their bodies are beset.

The following genus, *Gryllus*, includes the various tribes of locusts, grasshoppers, and crickets. In most species the larvæ resemble the perfect insect, and live underground; the chrysalids, also, are much like their parents, who generally feed on vegetables. The House Cricket regales on bread, meal, and flour; but their plunder is forgiven by the common people, from a notion that they bring good luck to the family.

I need not describe the cheerful Grasshopper, to whose evening chirpings we have so often listened on the lawn in summer. Its form will give you a general idea of that of its congeners; remarking, that the legs are adapted to leaping, by their great length and the breadth and strength of the thighs.

The *Gryllus gryllotalpa*, or Mole-cricket, is the most curious in its instincts, of any insect known in this country: they vary so much according to circumstances, and are so well suited to their purpose, that they appear the result of reflection, rather than a mechanical impulse. This sagacious creature is furnished with remarkably strong fore-legs, having very broad feet, divided into several sharp claws, fitted for burrowing in the ground. With these
it

it forms a subterranean cell of clammy earth, nearly the size and shape of a hen's egg, about a hand's breadth below the surface; secured from the approaches of ravenous insects by narrow avenues, winding passages, and a sort of entrenchment around it. In this safe retreat, the female deposits from two hundred and fifty to three hundred small eggs, which she guards carefully from enemies, especially the black beetle, whom she catches behind, and bites asunder with great dexterity. Some naturalists assert, that on the approach of winter or bad weather, they contrive to sink the nest deeper in the ground, that it may be out of the reach of frost; and, on the return of spring, raise it again, according to the season, till it receives the full influence of the air and sunshine. The mole-cricket is seldom seen above ground in the day; but at night it unfolds its plaited wings from beneath their short cases, and soars into the air. Its favourite food is the young roots of grasses, corn, &c. of course it is injurious to the husbandman.

What an insignificant being is proud man in the hands of his Creator! with whom a small insect is as powerful an instrument of destruction, as the most terrific convulsions of nature. If he send forth an army of Locusts, famine and pestilence follow in their train.

The

The depredations of this formidable insect, in warm weather, are truly terrible. Nor has this visitation been confined to the other quarters of the globe. Europe has occasionally felt its effects; and in the year 1748, a swarm of locusts made their appearance in England; but, happily, the damps and chills of our climate thinned their numbers, and checked their progress.

From authentic writers we learn, that in the eastern countries they come in myriads, so as to darken the air, and desolate whole provinces in a few days. Some of these prodigious swarms have been driven by high winds into rivers, where the offensive smell from their dead bodies has caused a plague. It would be impossible to conjecture where this calamity would cease, were it not that the benevolent Author of Nature has mixed mercy with his chastisements, and provided remedies for the evil. Sometimes they are destroyed by storms, at others carried to distant regions by violent winds, and generally accompanied by the locust-eater, a bird whose vast numbers seem proportioned to the insects they are appointed to destroy.

One species, the *Gryllus cristatus*, is eaten by the oriental nations. It is beautifully diversified with many colours: its body is bright red, with
black

black rings, and the legs varied with yellow; the upper wings are chequered with alternate changes of dark and pale green. It is about four inches from head to tail, and when its wings are expanded, they measure full seven inches from tip to tip.

The genus *Fulgora*, Lantern-fly, presents a race of insects at once luminous, splendid, and extraordinary.

The *Fulgora lanternaria*, or Peruvian Lantern-fly, is a large insect, with the head almost half its length, of an oval shape, and brilliant yellow, spotted and striped with a bright, reddish brown. From this head or lantern, it emits a strong, vivid, phosphoric light, sufficient to enable a person to read a small print. Several other species, natives of China and India, are also enriched with the most lively colours.

The genus *Cicada* is remarkable on account of two peculiarities: its voice, and the medium in which the larva lies concealed. The shrill musical note of these insects, has been celebrated by both ancients and moderns, as the enlivener of rural industry, and the harbinger of fine weather. Mr. Shaw, in his elegant account of insects, has commemorated this circumstance so agreeably, in a translation from
Anacreon,

Anacreon, that I think you will be pleased to have a copy of it.

Happy insect! blithe and gay,
Seated on the sunny spray,
And drunk with dew, the leaves among,
Singing sweet thy chirping song!

All the various seasons' treasures;
All the products of the plains,
Thus lie open to thy pleasures,
Fav'rite of the rural swains.

On thee the Muses fix their choice,
And Phœbus adds his own,
Who first inspir'd thy lively voice,
And tun'd the pleasing tone.

Thy cheerful note, in wood and vale,
Fills every heart with glee;
And summer smiles with double charms,
While thus proclaim'd by thee.

Like gods canst thou the nectar sip,
A lively, chirping elf;
From labour free, and free from care,
A little god thyself.

The vocal sound uttered by these insects, proceeds from a curious organ placed under the abdomen, composed of several membranaceous valves, put in motion by a powerful set
of.

of muscles, which is peculiar to the male, the female being entirely mute.

You must have often observed something like froth on the leaves of plants: this is no other than the covering in which the larva of the *Cicada spumaria*, or Cuckoo-spittle, hides itself from danger, serving the double purpose of a shelter from enemies and the heat of the sun. This froth exudes from the body of the larva, which is provided with a trunk or sucker, that enables it to extract the juices of plants, which are its food. There is scarcely any difference between the larva and the pupa, both are of a light green; but the perfect insect, popularly called Frog-hopper, is brown, with whitish bands across the upper wings.

I shall close my letter with the genus *Notonecta*, the chief species of which, *Notonecta glauca*, lives in stagnant waters. It swims on its back. The hinder feet are longer than the rest, and serve as paddles. If attempted to be caught, it dives and rises again with great celerity. Its food consists of water insects, and it flies only by night.

The season is charming, let us enjoy it, and devote some part of every day to the contemplation of the works of creation, and to the examination of the admirable order they display.

play. Thus, while we improve our health, we shall enlarge our minds, and rise from admiring visible objects, to the adoration of that Power by which they were formed. Accept the united love of our circle, with that of your affectionate

FELICIA.

LETTER.

LETTER VIII. •

*FELICIA TO CONSTANCE.**Shrubbery.*

DEAR CONSTANCE,

I DEVOTE the first leisure morning, to furnish you with the remaining genera of the second order, HEMIPTERA, and shall present you with that of *Nepa*, which, like the *Notonectæ*, are aquatics, and are to be found towards the edges of ponds and lakes; and as they do not fly by day-light, they may be seen of an evening skimming lightly about the neighbourhood of stagnant waters.

The *Nepa cinerea*, a native of our own country, appears of a dull brown, till it expands its wings and exposes its body, which, on the upper part, is bright red, with a stripe of black down the middle. From the tail proceeds a double tube, nearly as long as the body, so closely united, as, on a cursory view, to appear single. The female lays her eggs on the mud, beneath the water: they are of an oval shape, with the upper part surrounded by seven spines, spread out like radii.

The

The *Nepa linearis* is a slender insect, having very long processes at the end of the tail. The legs are formed for swimming, and when the animal inclines to move, they are all struck out with a sudden jirk, which is repeated for a considerable time, as if for the sake of exercise.

The next genus in succession, is *Cimex*, Bug, of which the species are numerous, and all of them have wings, except that most disgusting, nauseous insect, the Bed-bug. The larvæ of this genus differ from the perfect state, in the circumstance of having only the rudiments of wings previously to their final change, and they are of a voracious disposition.

This numerous genus is divided into several sections or classes, according to the general form or habits of the insects. Some of these live on the juices of plants, others on the blood of animals; most, if not all of them, are nourished by suction; for which they are furnished with a fine, sharp trunk, projecting from beneath the breast, in a straight direction. Some of them are inhabitants of the waters; whilst others conceal themselves in the crevices of wainscots or furniture. They are distinguished by their softness and fœtid smell.

However, your delicacy may shrink from the sight of the *Cimex domesticus*, or Common

Bug.

Bug, a nearer inspection will afford you, by the assistance of the microscope, the gratification of seeing the circulation of the blood, even through the legs, and an extraordinary vibration of the vessels, besides the motion of the internal parts; all which are well calculated to excite wonder and admiration.

The next genus comprises the different species of our old enemy the *Aphis*, or Plant-louse; a race that defies all rule, and perplexes the naturalist by its singularities. Of the facility with which they increase, their vast numbers, and their destructive properties to plants, we have had painful experience. The females bring forth their young alive in summer, and in autumn lay eggs; and though kept separate from the males for twenty generations, they continue to become the parents of a numerous offspring. Some of them have four erect wings, whilst others are destitute of wings; a difference that does not seem to depend on sex or age. Nor has there yet been any satisfactory reason assigned for this variation, by those who have made the subject their study; but it appears that both sexes indiscriminately acquire wings in the month of May. A calculation has been made, that the descendants of a single female *Aphis*, in five generations, will amount to five thousand nine hundred and four millions!

These

These insects have two beaks, one in the breast, and one in the head. Some are provided with two horns on their hinder parts, from which exude small drops of sweet water, which, with their excrement, that has the same saccharine quality, forms that moisture on the leaves of trees, called honey-dew. They are injurious to the vegetable world, wherever they are found; but are peculiarly destructive to hop and potatoe plantations. The different species resemble each other very nearly, and they are distinguished by the names of the plants they frequent. They have been known to emigrate from one place to another, in a very extraordinary manner; an instance of which is related by that eminent observer of nature, Mr. White, of Selbourne. He says, "that at about three o'clock in the afternoon, of a very hot day, the people of this village, (Selbourne,) were surprised by a shower of Aphides, or Smother-flies. Those that were walking in the streets, were covered with these insects, which settled also on the hedges and gardens, blackening all the vegetables where they alighted. My annuals were discoloured with them; and the stalks of a bed of onions were quite coated over for six days after. These armies were then, no doubt, in a state of emigration, shifting their quarters; and might have

have come, as far as we know, from the great hop plantations of Kent or Sussex, the wind being, all that day, in the easterly quarter. They were observed, at the same time, in great clouds, about Farnham, and all along the vale from Farnham to Alton.”

Wasps, ants, flies, and many other insects, are very fond of the honey-dew. This saccharine substance, especially for a length of time, gives the bark, or foliage of trees, such a sooty appearance, as to be mistaken for a kind of black mildew. The numerous swarms of these destructive insects are checked by severe winters: violent rains, attended with lightning, are also thought to be injurious to them. But the most powerful instruments to restrain them within due limits, are the insects which prey upon them; of which the principal are the lady-bird, a species of ichneumon, and the aphidivorous fly. The Ichneumon is very minute, black, and slender, and eats its way out of the aphid, where it was hatched, leaving the dry, inflated skin of the insect adhering to the leaf.

The insects of the genus *Chermes* are found on the leaves, young shoots, and bark of vegetables. These females insert their eggs under the surface of the leaves, by means of a tube, with which nature has furnished them, and
cause

cause the little tubercles, or galls, that you may have observed thickly beset on the leaves of the ash, the fir, the box, and the fig. The largest of these infests the fig-tree: the upper part is brown, the lower of a greenish hue: the wings are large, and so placed as to give the appearance of an acute roof. In the larva state, before they acquire their wings, many of them appear coated with a white, flocculent substance, of a clammy nature, which issues from the pores of the animal. If this down on the *Chermes alni* is rubbed off, the animal presently replaces it; being a secretion from the large pores placed in a circle towards the end of the body. These larvæ sometimes assemble in such numbers on the shoots of the tree, that they appear covered with white cotton. The Fir-tree *Chermes* produces that enormous scaly protuberance that is to be found at the summit of the branches of that tree; this tumor contains cells for the shelter of the young larvæ, which nearly resemble the perfect insect. The winged insects leap and spring with great agility, and they are the injurious inmates of a great number of trees and plants. Both larva and chrysalis eject a sweet-tasted, white matter, not unlike manna: it is found in small, white grains.

The

The genus *Coccus* is remarkable in many respects. The males differ much from the females, both in appearance and size, being considerably smaller, and furnished with two upright wings, of which the females are destitute. The females fix themselves closely to the roots and branches of plants: and some of them lose the form and appearance of insects; their bodies swell, their out-stretched skin becomes smooth, so that they resemble those galls, or excrescences, that are frequently seen on the leaves and branches of plants, and are sometimes mistaken for them. After this alteration, the abdomen serves only as a kind of covering, or shell, under which the eggs are concealed.

The most distinguished of this genus, and by far the most important, is the *Coccus cacti*, or Cochineal Insect, so celebrated for the beauty of the colour which it yields to the dyer. It is a native of South America; and its increase is encouraged as a valuable article of commerce, particularly in the country of Mexico. The female, in its full grown or torpid state, swells to such a size, in proportion to its former magnitude, that the legs, antennæ, and proboscis, become almost imperceptible without the assistance of a glass;

so that she is more like a seed, or berry, than an animal. This appearance formerly created a doubt, whether the cochineal was a berry, a seed, or an insect. When the female Cochineal attains its full size, it fixes to the surface of the leaf, and wraps itself up in a white cottony matter, which it is supposed to spin in a double thread, through its proboscis. The male is a small and slender fly, about the size of a flea, with jointed antennæ, and white wings, large in proportion to the body, which is red, with two long filaments proceeding from the tail. When the female has discharged all its eggs, it becomes a mere husk, and dies: so that the proprietors are very careful to prevent the young from escaping, by killing the parent before that event takes place. It is said that they are destroyed either by smoke, or the fumes of boiling vinegar, and when dried are sent to Europe; from whence the Spanish government is supposed to gain larger profits by the sale of this small insect, than by the produce of all its gold mines.

Its use in dyeing the finest scarlet is so well known, that it is unnecessary to repeat it. The beautiful carmine, which excels all other red paint, is prepared from the same substance;

as

as is the French rouge, so much used by the ladies of Europe, to give an artificial tint to faded beauty.

Before the discovery of America, the *Coccus Ilicis*, or Kermes, was the most valuable substance for dyeing scarlet. It was found on the *quercus coccifera*, a tree that grows plentifully in many parts of France, Spain, Greece, and the islands of the Archipelago.

There is another species, which is inferior in colour, called the *Coccus Polonicus*; which, as its name implies, is principally found in Poland.

The last genus of this order is *Thrips*, which consists of very small insects, principally found on flowers; upon which they run, or rather leap, with great vivacity, often bending their bodies upwards, so as nearly to touch the thorax with the tail. The principal distinction between the larva and the perfect insect, is the want of wings in the former.

The *Thrips physaphus* is supposed to be injurious to wheat and rye, by causing the young flowers to decay; but perhaps this, like many similar opinions, is merely a prejudice, as more attentive observers remark, that they affect diseased rather than healthy
E
plants,

plants, and probably are useful to consume the cause of the malady of the plant.

Having come to the conclusion of the second order, I shall, at the same time, bring my letter to a close, with my most affectionate love to all the family. I am yours,

FELICIA.

LETTER

LETTER IX.

*FELICIA TO CONSTANCE.**Shrubbery.*

DEAR SISTER,

THIS gay season of the year has a powerful effect in producing a serenity and cheerfulness of mind, that tends to enlarge benevolence, by exciting a sympathy with the general happiness that prevails throughout the face of nature, uniting, in every part, to the praise of its great Author. A clear sky, genial warmth, plants budding, insects humming, birds singing, the young of all creatures frisking about, and rejoicing in their new existence, is a spectacle that none but the coldest heart can behold with indifference. If I indulge these feelings further, I shall neglect the main object of my letter, which is to introduce to your notice, one of the most numerous, most richly and variously embellished, of the animal race, contained in the third order of insects, called *LEPIDOPTERA*; known, as I have remarked before, by having four wings, covered with minute scales, like fine feathers,

and a spiral tongue, that can be rolled up or extended at pleasure. Many of the most brilliant of the tribe of Butterflies and Moths, being natives of the warmer climates, we can never see them in the perfection of life and animation, but must content ourselves with beholding their splendid colours in the collections of the curious, or in books of natural history.

The Lepidopterous insects are divided into three genera:—*Papilio*, or Butterfly; *Sphinx*; and *Phalæna*, or Moth.

A prodigious number of species in the genus *Papilio*, has obliged naturalists to subdivide them into sections, or sets, dependent on the habit or general appearance, and frequently regulated by the variegation of colours. Lin-næus, the great master of natural arrangement, has chosen an elegant manner of uniting the divisions of these insects with civil history, by attaching to them some classical name of ancient times. The first section consists of *Equites*, which are again subdivided into Greeks and Trojans: the latter being distinguished by red spots on each side of their breasts, of which the former are destitute. The second division consists of the *Heliconii*; the third of the *Danai*; the fourth of the *Nymphales*; and the fifth contains the *Plebeiî*.
Each

Each of these sections have subdivisions and distinctions, too minute for me to particularize, but with which you may acquaint yourself from books of natural history, as you advance in the science.

The metamorphoses of this brilliant race of insects, from the larva to the butterfly state, are the most striking and extraordinary of any we know. The larvæ of butterflies are universally known by the name of caterpillar, and display great variety in their forms and colours; some being smooth, and others beset with spines.

A caterpillar, when grown to its full size, chooses a suitable retreat, and secures itself by silken filaments, which it spins from its mouth; it then casts off the caterpillar's skin, and commences chrysalis, lying dormant, under this disguise, till the enclosed butterfly is ready to emerge from its confinement, which, as soon as its wings acquire strength, suddenly bursts from its tomb, and roves at pleasure through the balmy air.

I do not doubt that you may have read, amongst the prodigies of ancient times, of showers of blood; an event that is rationally accounted for by the more enlightened discoveries of modern times, from the following circumstance, which was unknown to our ancestors.

cestors. The papilionaceous insects, in general, soon after their liberation from the chrysalis, discharge some drops of a red-coloured fluid, which, uniting with the superstition of the times, accounts for the phenomenon, related with all the addition of marvellous fear. Few examples only, of this numerous tribe, must satisfy your curiosity for the present, or I shall swell my letter into a volume.

From amongst the *Equites Iroës*, I select the butterfly named after king Priam, as one of the most beautiful of the whole genus. Its extended wings measure more than six inches: the upper wings are of velvet black, with a broad band of bright grass green, of the lustre of satin, drawn across the upper and lower parts of the wings. On the contrary, the lower wings are of the same green, edged with velvet black, and marked by four spots of the same colour, while at the upper part of each is an orange coloured spot. The thorax is black, with sprinklings of lucid green in the middle; and the abdomen is of a bright gold colour. It is a rare insect, and is found on the island of Amboyna.

Amongst the Greek heroes, the butterfly *Menelaus* is particularly striking. It is about the same size as the Priam, and its colour the most brilliant silver blue that imagination can conceive,

conceive, changing with the variation of the light, sometimes to a greenish cast: the under part of it is brown, and it is a native of South America.

The Swallow-tailed Butterfly, surnamed *Machaon*, is the only one of the tribe of *Equites* that our country can boast. It is of a beautiful yellow, with black spots along the upper edge of the superior wings. A deep edging of black, borders all the wings, decorated by a double row of crescent-shaped spots, of which the upper is blue, and the lower yellow: the under wings are tailed, and are marked at the tip with a round, red spot, bordered with blue and black. The caterpillar is a bright green, with bands of a deep glossy purple, enriched with yellow spots. It feeds on fennel, and other umbelliferous plants.

Of the *Heliconii*, I shall give you an example in the butterfly called Apollo. It is a native of many parts of Europe, but has not yet appeared in our own country. The wings are white, adorned with velvet black spots, and on each of the lower ones are two most beautiful carmine-coloured circles, with a white centre, and black border.

In the division *Danai candidi*, the *Papilio rhamni*, or Buck-thorn Butterfly, is of a bright sulphur

sulphur colour, with sharp-cornered wings, marked by a small orange spot in the middle of each. It frequents meadows, during spring and autumn.

The beauties of the Peacock Butterfly, classically called *Io*, are well known to you. It ranks among the *Nymphales gemmati*. The caterpillar is of a deep black, dotted with a little white: its food is the nettle. It changes to a chrysalis in the beginning of July, and assumes the form of a butterfly in August, frequenting lanes and hedge-rows.

The butterfly *Atalanta*, or the Admirable Butterfly, is one of the most splendid of the British species. The wings are of the deepest black, adorned with a border of carmine.

The buckthorn affords nourishment to the *Betulae*, which is of a blackish brown, barred with orange colour. It is often found in woods.

Beauty and deformity are qualities of a very opposite nature; the one excites admiration, whilst the other produces nothing but aversion: yet they frequently lead to the same point, and are the remote causes of the destruction of their possessors. A spider is stamped upon without mercy, because he is ugly; and the tender wing of the butterfly, is frequently crushed by the hand of its admirer. The same consequences

quences sometimes attend these qualities in beings of a higher rank: a homely woman is contemned, and a distinguished beauty is too often the victim of her adorer. Lord Byron, in his “Giaour,” has expressed this effect of beauty in so striking a manner, that I shall enrich my letter with the quotation.

“As, rising on its purple wing,
 The insect green of eastern spring,
 O'er emerald meadows of Kashmeer,
 Invites the young pursuer near,
 And leads him on from flow'r to flow'r,
 A weary chase, a wasted hour,
 Then leaves him, as it soars on high,
 With panting heart and tearful eye:
 So beauty lures the full-grown child,
 With hue as bright, and wing as wild,
 A chase of idle hopes and fears,
 Begun in folly, clos'd in tears.
 If won, to equal ills betray'd,
 Woe waits the insect and the maid.
 A life of pain—the loss of peace,
 From infant's play—and man's caprice.
 The lovely toy, so fiercely sought,
 Has lost its charm by being caught;
 For ev'ry touch that woo'd its stay,
 Has brush'd its brightest hues away.
 Till charm, and hue, and beauty gone,
 'Tis left to fly and fall alone.
 With wounded wing and bleeding breast,
 Ah! where can either victim rest?

Can this, with faded pinion, soar
 From rose to tulip, as before?
 Or beauty, blighted in an hour,
 Find peace within her broken bower?
 No; gayer insects fluttering by,
 Ne'er droop the wing o'er those that die;
 And lovelier things have mercy shown,
 To ev'ry failing but their own;
 And ev'ry woe a tear may claim,
 Except an erring sister's shame."

The second genus is distinguished by the name of *Sphinx*, from a fancied resemblance, in the attitude of their caterpillars, to that of the Egyptian sphinx, caused by fixing the hinder part of their body to a branch of a tree, and holding the fore-part erect. Many of them spin their web, compounding with it small parcels of earth and grains of corn. They are popularly called Hawk-moths, and mostly have a large thorax and thick body, tapering towards the extremity. The flight of the larger kinds is either early in the morning, or after sun-set: they fly sluggishly, often uttering a kind of sound. They suck the nectar of flowers with their tongues, though they seldom settle long upon them. Some of them are very beautiful; but, as I fear that you will be tired of descriptions, I shall select only the *Sphinx atropes*, as being distinguished for

for its size and elegance. The upper wings are of a fine dark grey, variegated with orange and white; the under are of a bright orange, marked by a pair of black bands. The body is orange colour, barred with black; but its greatest singularity is a very large patch on the top of the thorax, representing the figure of a death's head. Corresponding with this melancholy insignia, this insect emits a shrill sound, very much like that of a bat or mouse; and, from the union of these circumstances, is regarded by the vulgar, in many parts of Europe, as an omen of death. The caterpillar to which the Atropos owes its origin, is superior in size and beauty to most others. It is sometimes nearly five inches long, is of a bright yellow, the sides marked by a row of elegant broad stripes, of a mixed violet and sky-blue colour. The tops of these bands form angles on the back, and are varied with jet black specks. If you wish to see this handsome caterpillar, you must search in the potatoe plants or jessamine trees, which are its favourite food.

The third and last genus is the *Phalæna*, or Moth, which contains a vast number of species, and is divided into assortments, according to the different habits of the animals. For these distinctions, I shall refer you to more skilful entomologists.

entomologists, and describe only a few of the most remarkable.

The *Phalæna Atlas* is a native of both the Indies, and its wings frequently measure eight inches from tip to tip; the ground colour is a rich orange brown, and in the middle of each wing is a large, triangular, transparent spot, bordered with black.

The finest European species is the *Phalæna Junonia*, or Peacock Moth. It is found in many parts of Germany, Italy, and France; but has not yet been seen in England. It is beautifully variegated in different shades of grey, black, and brown; and has on the middle of each wing an eye-shaped spot, the centre black, shaded on one side with blue, surrounded with red brown, and included by a circle of black: an elegant edging of very pale brown, encircles all the wings, and the antennæ are finely fringed. The caterpillar from which this beautiful moth proceeds, feeds on the apple and pear trees. Its colour is an apple green, and each segment of the body is ornamented with a row of upright projections of bright blue, surrounded by long, black filaments, each of which terminates in an elevated tip.

The smaller Peacock Moth is a native of England, and is popularly called the Emperor Moth:

Moth : it resembles the one I have just described, except being of a more diminutive size.

The great Tiger Moth is another beautiful English species. The upper wings are of a fine, pale, cream colour, barred and spotted with brown; whilst the lower are red, with black spots. The caterpillar is brown, with white specks. It feeds upon nettles, changes into a chrysalis in May, and produces a moth in June, which frequents lettuces and other pot-herbs.

Caterpillars, or larvæ of the LEPIDOPTERA order, have different modes of sheltering themselves from the changes of the weather and the ravages of their enemies. Some of them roll up the leaves of plants for their habitations; others, which feed only on the interior surface of leaves, lodge themselves under the outward skin; others conceal themselves in woollen cloths, skins of beasts and birds, &c. That of the *Phalæna viluna*, found principally on willows and poplars, at the time of undergoing its change descends to the lower part of the tree, forming a glutinous case as a security, by moistening the woody fibres of the tree with its saliva. This ingenious coat of mail, resembling the colour of the bark, is well adapted to elude observation, and is so close as to resist the frost, and too strong to be successfully attacked

attacked by birds; but when it is required, this hard texture is softened by the moth, when emerging from its imprisonment, by a quantity of fluid, with which it is furnished for that purpose. Some few of the larvæ live in society, under a kind of web, formed by their joint industry. The caterpillar of the Brown-tailed Moth furnishes an example of this kind: as soon as the young caterpillars are hatched, they begin a small web, and feed on the foliage of the tree, arranging themselves with great regularity in rows, and at first devour only the upper parts of the leaves, retiring in the evening to their web. In about three weeks they cast their skin, and enlarge their web from time to time, forming it on all sides as strong as possible. Under this covering they remain the whole winter in a state of torpidity, till, being revived by the genial season of spring, they again issue forth. Having become stronger, they devour the whole substance of the leaves, without distinction of parts, and sometimes are so numerous, as to cause great destruction to the verdure of the country.

The most valuable of all moths, is the Silkworm, with whose metamorphosis and figure you are well acquainted. The art of converting its silk into use, is said to have been first
invented

invented in the island of Cos, by a lady named Pamphylis.

This division includes the moths that are so injurious to woollen and stuffs, by devouring the substance, and forming a tubular case, with open extremities, generally assimilated to the colour of the cloth on which it is nourished.

I shall close my account of *Phalænæ*, with the description of the *Alucitæ*, which is extremely elegant; its wings consisting of the most beautiful distinct plumes, of a snowy whiteness. The caterpillar is yellowish green, speckled with black; feeds on nettles, and changes into a blackish chrysalis, enveloped in a white web.

The unusual length of this letter, renders unnecessary any apology for concluding myself, your affectionate sister,

FELICIA.

LETTER

LETTER X.

FROM FELICIA TO CONSTANCE.

Shrubbery.

DEAR SISTER,

THE fourth order, NEUROPTERA, is distinguished by four naked, transparent wings, forming a net-work, with veins or nerves, and a tail without a sting. It will not present us with such a splendid variety and combination of colours beautifully disposed, as that we last examined; but it is equally interesting, by the diversity of its metamorphoses, habits, and forms; the larvæ and perfect insect in some of the genera, differing as much from each other as creatures of a dissimilar kind.

The first genus, *Libellula*, or Dragon-fly, is doubtless familiar to you; though, I dare say, you are not aware that this brilliant and lively insect, which you have so often seen flying with such rapidity in the gardens and meadows, pursuing the smaller insects with the rapacity of a bird of prey, had spent the larger part of its existence in the water, before it assumed its flying form.

There

There are many species, both foreign and British: the most remarkable of the latter, is the great variegated Dragon-fly. This insect is seen in the beginning of autumn, and is remarkably elegant. Examine its head, and you will perceive something like a mask, which, opening in the middle by a sort of hinge, serves to hold its prey while it is devouring it. The female deposits her eggs in the water, which, sinking to the bottom, produce larvæ or caterpillars of a very singular and disagreeable aspect. Their colour is a dusky brown, and they cast their skins several times before they arrive at their full size. In the pupa state, the rudiments of the future wings are very apparent. These larvæ are excessively voracious, devouring great numbers of the smaller water-insects, without distinction of kinds. They continue in their larva and pupa states for two years, when they prepare for their liberation to that of the fly, by creeping up the stem of some water-plant, and grasping it with their feet, make an effort, by which the skin of the back and head is forced open, and makes way for the animal to get free: it first puts forth its head and wings, (which, like those of butterflies, are then short, tender, and contracted,) and afterwards gradually draws out the body. This curious transformation

formation generally takes place in the morning, and during the clear sunshine. Its improved existence is enjoyed but a short time, in comparison with that which it passed in the watery element: the frosts of autumn destroy all of them which are not devoured by different kinds of birds. How extraordinary! that the same creature, in its different changes, should at one time inhabit the water, and would then certainly perish if long exposed to the air; whilst, under another form, it can live only in the air, and would effectually be destroyed by submersion under the water!

The foreign Dragon-flies are very numerous: that of the *Libellula Lucretia* is the most remarkable, from the extreme length and slenderness of its body. In most of the species, the structure of the cornea, or external coat of the eye, is most wonderful, being marked by a prodigious number of interesting lines, that, when examined by a microscope, exhibit so many hexagonal lenses, of equal convexity on both surfaces. These are each supposed to be a distinct eye; and, according to the computation of Leewenhoëk, one only of these clusters contains about twelve thousand five hundred and forty-four of these lenses! Those dragon-flies whose wings are extended horizontally when at rest, live chiefly upon
moths;

moths; whilst others, whose wings stand erect, and are placed at a distance from each other, with prominent eyes, feed upon *Muscæ*, or flies.

The second genus, *Ephemera*, is remarkable for the shortness of its existence in the fly state, which sometimes does not exceed half an hour; though some of them, whilst caterpillars, live in the water for three whole years, where earth and clay seem to be their only nourishment. The larva, when ready to quit that state, rises to the surface of the water, and getting instantaneously rid of its skin, becomes a chrysalis. This chrysalis is furnished with wings, which convey it to the first tree within reach, upon which it settles, and, in the same moment, quits a second skin, and undergoes its last change to a perfect *Ephemera*. Those species that answer this description, live some days in the larva and chrysalis state. They have fringes of hair, which answer the purpose of fins. In both states their abdomen is terminated by three threads. Whilst larvæ, they scoop themselves out dwellings in the banks of rivers, in the form of tubes made like syphons; the one end serving for an entrance, the other affording them an outlet. The banks of some rivers are often full of these curious habitations. In case of the decrease of the water, instinct teaches

teaches them to dig fresh boles lower down, for their security.

The most familiar species is the common May-fly, so plentiful in the early part of summer, in the vicinity of rivulets and stagnant waters. It is of a greenish brown colour, with transparent wings, elegantly mottled with brown, and has three very long, black bristles, at the extremity of the body. The larva is of a lengthened shape, beset on each side of the body with finny plumes, and, at the tail, with three long, feathered processes. When arrived at its full size, the rudiments of wings, resembling a pair of oblong sheaths, or scales, are visible on the back. It is a favourite food of several kinds of fishes, particularly the trout. Some seasons are so favourable to its increase, that the air, in the immediate neighbourhood of its natal waters, is frequently blackened by its numbers, during the evening hours: and we are told, that in some parts of the duchy of Carniola, a district in Germany, they are used as a manure.

The third genus is called *Phrygania*. The insects of which it consists have so near a resemblance to some of the moth tribe, that they may easily be mistaken for them: the difference, however, is marked by their palpi, or feelers, the stemmeta on the top of the head, and

and the hairs which cover their wings, instead of the scales that adorn those of the *Jinneæ*, to which they bear the greatest affinity. The larvæ of these insects live in the water, in tubes formed of silken fibres, covered on the outside with small pieces of wood, sand, gravel, leaves of plants, &c.; and sometimes even the smaller testaceous animals are dragged alive about with them. These larvæ have an instinctive skill of making their habitations nearly in equilibrium with the water: when too heavy, they add a bit of wood or straw; when too light, a bit of gravel. These tubes are open at each end, and the larvæ which inhabit them, when feeding, stretch out the head and fore parts of the body, and creep along the bottom of the water. In most species there is an upright papilla, or process, which serves as a prop, to prevent the tube from slipping too forward, whilst the insect is thus employed. When this creature is approaching its change to a chrysalis, he stops up the openings of its tube with threads of a loose texture, through which the water easily penetrates, though they resist the approach of voracious insects. The members of the winged insect are visible through its thin covering, and as soon as they are on the point of being developed, the tube, with its chrysalis, rises
to

to the surface of the water, where the *Phrygania*, now complete, deserts its tube, and enjoys the sweets of the country, fluttering for a short time upon trees and plants, and then performs its last act of existence, by depositing its eggs in the water. The larvæ of the different species, make use of various materials in forming their tubes; some of them enclose themselves in the water-lentil, cut out into regular squares, and fitted one to another. Swallows feed upon them: they are also a favourite food with the trout, and are, in consequence, frequently used as baits for fishing.

One of the largest kinds is the *Phrygania grandis*. Its general aspect resembles a moth: the upper wings are grey, marked by various streaks and specks of different shades, whilst the under ones are of a yellowish brown, and semi-transparent.

The next genus, *Hemerobius*, takes its name from the shortness of its existence, which, however, continues several days.

The most common species, the *Hemerobius perla*, is an insect of extreme beauty. It is most common in the summer season; and is a slender-bodied fly, of a grass-green, with bright gold-coloured eyes, and four large, transparent, oval wings, with a fine net-work of pale green veins. It is frequently seen in the neighbourhood
of

of gardens; and, if pressed, diffuses a most disagreeable odour. The appearance of its eggs differs greatly from that of other insects, having a greater resemblance, at first view, to a minute vegetable, than the production of an animal. Each of them is supported on a delicate stem, of a gummy nature, more than half an inch long, attached to the surface of a leaf or twig. Groups of them may be found on those of the lime-tree in particular, and are more likely to abound on such plants or trees as are infested with aphides: the larvæ devouring those insects with great avidity, for which they have received the appellation of Lion of the Plant-lice.

The *Myrmeleon*, or Ant-eater, is the next genus. The species best known is the Lion-pismire, the larvæ of which is distinguished for its curious instincts in preparing a kind of pit-fall, for the entrapment of those insects that are its prey. The fly is not much unlike a small dragon-fly. It is an insect of prey, flying chiefly by night, and pursuing the smaller insects with great avidity. It deposits its eggs in dry, sandy situations; and the young larvæ, as soon as they are hatched, untaught by any instructor but a natural impulse, turn themselves rapidly round, in order to form a very small, conical cavity in the sand. The little
animal

animal conceals itself under the centre of the cavity, suddenly rushing forth at intervals, in order to seize any small insect, which, by approaching the edge of the den, has been so unfortunate as to fall in; and after sucking out its juices with its dentated forceps, which are sharp, and hollow within, throws it, by a strong effort, to a considerable distance from its subterraneous abode, lest any other creature should be rendered aware of its danger. Its colour is grey, and its body is covered with small protuberances, and has, on the whole, an unpleasing aspect, something like a flat-bodied spider. It survives the first winter in its larvæ state, taking no nourishment during that time; but in the spring resumes its voracious disposition. It prepares its pit by tracing an outward circle, of the diameter of the cavity, turning about in a circle till it gets to the centre; thus marking several volutes in the sand, resembling the impression of a large snail shell, deepening it gradually, and throwing out the superfluous sand with its horns. This manœuvre is effected by closing its forceps in such a manner, that, with the head, they answer the purpose of a shovel, with which it throws the sand with such force, that the grains often fall a foot beyond the brink. Mischievous overtakes every insect that happens to fall into
that

that pit. The *Myrmeleon*, who is apprised of its approach by the grains of sand rolling down to the bottom, overwhelms his victim, then drags him to the bottom of the hole, seizes him with his forceps, and sucks his vitals. When full grown, it envelopes itself in a round ball of sand, gummed and connected by very fine silken fibres, which it draws from a projecting tube at the extremity of its body. This interesting insect is found in many parts of the Continent, but has not been seen in England.

The Scorpion Fly is the most common species of the genus *Panorpa*. It frequents meadows, during the early part of summer. This insect has a longish body, with four transparent wings, elegantly variegated with deep brown spots. In the male, the end of the tail is turned up, and terminates in a kind of forceps, that has a threatening aspect, but does no mischief. The larva and chrysalis of this genus are unknown.

The *Raphidia* is the last genus of this order, which contains but few species. That of the *Raphidia ophiopsis* is a smallish fly, with transparent wings, and a narrow thorax, stretching forward in a remarkable manner. It is a rare insect, and is chiefly found in woods and hedges.

I am fearful of wearying your attention by presenting too many objects to you at once; and, as I have come to the conclusion of the order, shall terminate my letter. With much affection, your

FELICIA.

LETTER.

LETTER XI.

*FELISIA TO CONSTANCE.**Shrubbery.*

DEAR SISTER,

THE further I advance in the study of Entomology, the more I am charmed with the variety of form, embellishments, habits, and contrivances, bestowed upon the different tribes of insects, of which the fifth order, HYMENOPTERA, will furnish several examples. Remember, that its characteristics are, four wings, generally membranaceous; tail of the female armed with a sting.

The insects of the first genus, *Cynips*, or Gall-fly, are concealed in the little, smooth, round, hard galls, found under the oak leaves, and those of other trees, generally fastened to the fibres. Those of the *quercus folii*, have a single one in each gall. These galls are of a woody substance, formed like the nest, by the exuding of the sap of the leaf, occasioned by the puncture of the female, when she deposits her eggs.

The *Cynips quercus gemmæ*, is another species which deposits its future progeny in the oak buds, and produces one of the finest galls, leafed like a rose-bud beginning to blow. Whilst the gall is small, these leaves are compressed, and are set one upon another, like the tiles of a roof. Open one of these galls, and you will find a kind of ligneous kernel, enclosing a cavity, that serves as a cradle for the little larva, which undergoes its metamorphosis in that enclosure. Oak trees afford nourishment to a multitude of insects. Barbut says, that not less than fifty species, of this tribe alone, are supported on it.

The *Cynips rosæ*, produces on the sweet-brier, dog-rose, &c. a gall of a singular appearance, resembling a beautiful heap of delicate green moss, tinged with red. You may have frequently observed them in autumn: a small, white maggot, is discovered in the centre of this solid, fleshy substance; and sometimes there are several inhabitants in the same mass. The leaves of willows are marked by large, irregular, red swellings, during the summer, which are caused by a small species of the *Cynips*, of a yellow colour, with a black thorax. The process of forming these galls is very curious: the insect penetrates the bark, leaf, or spot which begins to bud, and there sheds a drop

drop of corrosive fluid, lays its egg, and dies. The circulation of the nutritive juices being interrupted by the infusion of this poison, the adjacent parts are corroded, and the natural colour of the plant altered; the gall-nut is thus produced by the sap or juice, which, from this circumstance, is turned out of its usual course.

The second genus, *Tenthredo*, or Saw-fly, is so named from the formation of its sting, which differs from that of all other insects, those of the following genus only excepted.

The species of the *Tenthridines* are very numerous, and differ from one another in colour and size. Some, by means of their saw, deposit in the buds of flowers, others on the twigs of trees or shrubs, eggs, which produce larvæ, called false caterpillars, that bear a great resemblance to those of the order Lepidoptera, or real caterpillars; from which, however, you may readily distinguish them, by the number of feet being generally from eighteen to twenty-two; whilst those of the true kind never exceed sixteen, and are seldom so numerous. They feed on the leaves of plants, particularly the rose and the willow, and undergo their chrysalis state in a strong, gummy envelopment, prepared with silken threads in autumn,

autumn, from which the complete insect is liberated in the following spring.

The larvæ of the smaller species are very injurious to different kinds of esculent vegetables, particularly turnips. Mr. Marshall, the agriculturist, has collected a number of curious facts relative to that destructive kind, specifically named the Turnip-fly. From the testimony of fishermen, and others with whom he conversed, who had been long resident on the coast of Norfolk, there seems no doubt that they emigrate in the fly state, in countless millions, from some distant country, probably the north of Europe, across the ocean, being forwarded in their progress by a north-east wind. They arrive in clouds, are supposed to rest occasionally on the surface of the water, and are frequently seen lying in shoals on the beach, in an exhausted condition, from which they are revived by the warmth of the sun. The appearance of the black canker, as they are popularly called, justly alarms the farmer with an omen of destruction to his crop of turnips, unless the rooks befriend him, or he is able to thin the numbers of the caterpillars, by regaling his ducks with them. The parent fly inserts her eggs, by means of her sawed tube, in the fleshy part of the turnip-leaf: they hatch in about ten days. The young caterpillars

pillars are extremely voracious, and in that state cause so much mischief, as to destroy the whole crop.

One of the principal species is the *Tenthredo lutea*, which proceeds from a large green larva, adorned with a double row of black specks along each side. The chrysalis, which is of a palish brown, displays the limbs of the future fly, which is yellow, barred with black, and nearly as large as a common wasp.

The larvæ of the genus *Sirex*, live in the decayed parts of trees, on the substance of which they feed. The limbs of the perfect insect are as clearly perceptible in the chrysalis, as in the genus *Tenthredo*. It is rarely seen in this country; but some species have been caught here.

The largest species is the *Sirex gigas*, which exceeds a hornet in size, and is principally observed in the neighbourhood of pine-bearing trees. It is black, with the eyes and lower half of the abdomen bright orange colour: the thorax is hairy, and the wings of a transparent, yellowish brown. The sting is very conspicuous, and consists of three laminae or parts: two at the sides, which serve for sheaths; and one in the middle, rather toothed, which is the real sting, and is forked at the end. The male is smaller than the female, and has
neither.

neither spine nor sting. If the larva changes to a chrysalis in summer, a fly proceeds from it in about three weeks; but if at the close of autumn, it lies dormant the whole winter, and is not released from its confinement till the following spring.

The genus *Ichneumon* presents great variety of insects, who provide for the support of their offspring in a most extraordinary manner; the female being furnished by Nature with an instrument resembling a whimble, with which she deposits her eggs in the bodies of other insects whilst alive, and generally in those of caterpillars. For this purpose, the female *Ichneumon*, according to her kind, selects her proper victim, and pierces its skin with her tube, introducing her eggs beneath the surface. The animal thus injured, has no means of redress: all its endeavours to escape are in vain. The *Ichneumon* never quits her hold till she has discharged her whole stock; and what is still more astonishing, the vitals of the caterpillar are so little affected, that it frequently survives some time after the young larvæ have fed upon its nutritious juices; and there have been instances of its transforming into a chrysalis.

The well-known caterpillar of the Common White or Cabbage Butterfly, affords one of the
most

most familiar examples of this singular process, which you may observe in the autumn. When you perceive a caterpillar of this kind creeping into some corner, in order to undergo its own change into a chrysalis, watch it, and in the space of a day or two, it is likely you will see a numerous tribe of small maggots emerging from it, and immediately proceeding to envelope themselves in distinct yellow silken cases, forming one group round the caterpillar. Other small species of *Ichneumon* pierce the skins of newly changed chrysalids, butterflies, and moths, in which their larvæ remain during their incomplete state. Others again are so very small, that the female deposits a single egg in the eggs of moths and other insects. However formidable this race may be to the caterpillars, they are very useful to man, by destroying multitudes of the plant-lice and other insects; and in some seasons, when the increase of caterpillars has been very injurious, these cannibal insects have multiplied in proportion. One of their characteristics in the fly state, is the continual agitation of their antennæ; and another, that the abdomen is generally joined to the body by a stalk or pedicle.

The next genus, *Sphex*, or Savage, has an instinct in one respect directly opposite to that

of the Ichneumon, as, instead of depositing their eggs in the bodies of living insects, they insert theirs in those that are dead, that the young larvæ, when hatched, may find a proper supply. This provident care for the welfare of its young, is combined with the most savage disposition towards other creatures. The manner of living, the form of the body, and the place of harbour, varying in different species; yet all agree in being the fiercest of flies. Nor do they fear to attack insects much larger than themselves, whether defenceless or armed. They are endowed with strength great in proportion to their size. Their jaws are hard and sharp; and in their sting lies a poison, suddenly fatal to the creatures with which they engage. On the first seizure, the Savage gives a stroke of amazing force; after which he falls down, as if he himself had received the blow; but it is only to rest from his fatigue, and enjoy his victory. Numerous are the insects that become his victims; for no part of them serve him for food but the eyes, the filament that supplies the place of a brain, and a small part of the contents of the body.

The *Sphex figulus* having found a convenient retreat, seizes on a spider, and having killed it, deposits it at the bottom of her cell, and laying her egg in it, she closes up the
 orifice

orifice of the cavity with clay. The larva, which resembles the maggot of a bee, having devoured the spider, encloses itself in a dusky silken web, and becomes a chrysalis, from which, in a certain number of days, proceeds a complete insect. The parent SpheX has not completed her work, till she has prepared several separate holes, in each of which she places a dead insect and an egg, each cell costing her the labour of nearly two days.

Many species are common in England. They bear great affinity to the race of wasps and bees, and are chiefly found in woods and hedges.

The genus *Chrysis*, or Golden-fly, is remarkable for its brilliancy of colour. That species most common in our own country, is the *Chrysis ignitis*. It dwells in holes of walls, harbouring between the stones and the mortar that cements them; where it lays its eggs. The larvæ resemble those of the wasp. It is about the size of the common window-fly, and is of a rich, deep, gilded azure, on the head and thorax, with the abdomen of the most splendid reddish gold colour.

I shall now introduce to you a more minute acquaintance, the genus *Vespa*, or Wasp, whose external appearance is too familiar to need any description. The mode of life of these insects

greatly

greatly resembles that of the bee; and the curious structure of their nests, equals the sagacity of that insect, in its order and accommodation. They frequently choose some dry bank, on which they form their city; its shape is that of an upright oval, measuring about ten or twelve inches in diameter. The inside consists of several stages, of hexagonal or six-sided cells, placed horizontally, and the interstices of each stage being connected by upright pillars. The outside of the nest is guarded by a great many layers of a paper-like substance, so disposed as to secure their dwelling from the effects of cold and damp. This external covering is formed of the fibres of various dry vegetable substances, connected together by a gummy fluid, discharged from the mouths of the insects during their operations. This numerous commonwealth is founded by a single female, who deposits one egg in each cell, which serves as a cradle for the young larvæ or maggots. These are fed by the neuter or labouring wasps, with a coarse kind of honey; and when arrived at their full size, close up their respective cells with a fine tissue of silken filaments, and after a certain period emerge in their complete form. The male insects are destitute of a sting, and are very few in number, in comparison with the neuter or labouring insects.

insects. They are of a very voracious disposition, living occasionally on flesh, and are extremely destructive to fruit; but as they do not lay up a store of honey for winter use, but few of them survive that season, and those which do, are in a torpid state.

Vespa crabro, or the Hornet, is a large species of wasp, that makes its nest in the trunks of hollow trees, in timber-yards, or similar situations. Its comb is composed of a substance like coarse paper or rusty parchment. It is very voracious, devouring other insects, and even bees. A highly elegant wasps' nest, not much larger than an egg, has been sometimes seen during the summer, hanging, as it were, by its base, to some convenient projection within. It consists of several bells, one above another, the interior alone being entire, and furnished with a small, round opening, the rest reaching only about two-thirds from the base of the nest. In the centre of the interior bell, are situated the ranges of cells built round a small pillar attached to the base: they are not very numerous, and the openings of these cells are downwards. As I intend to devote a whole letter to that valuable insect the bee, which next succeeds in order, I shall, for the present, bid you adieu, with every wish for your happiness and enjoyment.

FELICIA.

LETTER XII.

*FELICIA TO CONSTANCE.**Shrubbery.*

DEAR SISTER,

THE next genus that presents itself to our view, is that of *Apis*, or Bee, which will furnish you with matter for observation during the whole course of the summer, in my aunt's glass bee-hives, where you will have an opportunity of seeing the process of their labours and instincts, that I am going to describe.

The genus is extensive, and is divided by Linnæus into two classes; those in which the body is but slightly covered with fine down, and those which are thickly clothed with hair. The latter are commonly called Humble Bees; but, as I have already said, many kinds are contained in these divisions, whose talents, manners, and dispositions, are greatly varied. Some live in society, others dwell and work in solitude, building the cradles for their progeny with the leaf of the rose-tree, of which the Leaf-cutter bee is an example: the Mason-bee uses a
kind.

kind of plaster ; and the Wood-piercer, saw-dust, for the same purpose.

The species the most important to us, is the common Honey Bee, which has always been celebrated as an example of industry, order, and foresight ; though these qualities must be ascribed solely to an instinct, which impels these animals to pursue their occupations with certain success, from always adopting the same mode of accomplishing them. The same Power that has endowed them with these dispositions, has also furnished them with organs suited to their operations.

A swarm of bees is composed of three kinds : a female or queen ; and labourers, which are supposed to be of no sex. There is seldom more than one queen in a hive, though more have been occasionally observed. The males are few in number, compared with the labourers, who probably exceed them in the proportion of an hundred to one. The queen is not so large in the trunk as the males, and rather larger in every part than the labourers. Her size and shape differ in summer from what it is in the winter, being then much larger ; and she has a sting similar to that of the working bee, an instrument of defence, of which the male bee, or drone, is destitute. For this deficiency we shall hereafter find a reason. The
structure

structure of the labouring bee is curiously adapted to the offices it has to perform: the tongue is of a peculiar construction, extremely large in proportion to the size of the creature: in length it consists of three parts; one, its articulation with the head, which has some affinity to the larynx in the human body; the next, the body of the tongue, formed of a kind of base, which supports the true tongue: this base is of a horny substance, in which there is a groove, and it is united with the larynx. On the end of this is fixed the true tongue, with its different parts. This apparatus is enclosed in two horny scales; each of these is likewise composed of two parts, or scales, one articulated with the other. The mechanism of this curious member is so complete and minute, (consisting, according to Barbut, of twenty parts,) that I fear I cannot give you a further account of it, unless by a sketch of its figure, with which I will endeavour to furnish you. The whole apparatus can be folded up into a very small compass, under the head and neck. The formation of the œsophagus terminates in a fine, transparent bag, which is the immediate receiver of whatever is swallowed: from this bag the food is either carried further into the stomach, for the nourishment of the animal, or is regurgitated for other purposes. This bag, or
craw,

craw, is something similar in its use to the craw of pigeons, and several other kinds of birds, which throw up part of what they have eaten, in order to feed their young. The whole internal structure of the bee is well adapted to this purpose.

The sting is an apparatus equally curious, and suited to its office, inflicting a wound, and, at the same time, conveying a poison into that wound. It consists of two small darts, or piercers, barbed at their extremity, conducted in a groove, and enclosed in a scaly sheath. The muscles by which this sting is moved, are very strong, and well calculated to give it motion in almost all directions. Whether this weapon is used as an instrument of offence or defence, it is generally fatal to the bee, as well as injurious to its enemy; for the darts being serrated at the edges, can seldom be withdrawn, without dragging out the whole apparatus, with part of the bowels.

There is no doubt that bees possess the five senses: they have also the power of uttering a voice. Those accustomed to bees, can immediately tell when a bee makes an attack, by the sound, which is most likely caused by the wings; but if they are hurt, or in distress, they utter a cry, independent of their wings, which has been proved, by the experiment of smearing

smearing them over with honey. Previously to swarming, they utter a peculiar sound, which may be compared to that of a small trumpet, as if to give notice to their companions of their intended removal. The bee undergoes the same metamorphoses as other insects.

It is time to turn your attention to their employments, and the materials they collect. A hive frequently sends off a colony about the beginning of June, when the numbers of inhabitants would be too large for their limits: the young swarm prepares to quit their parental dwelling by hanging about the mouth of the entrance for some days, as if watching for fine weather for taking their flight. It is supposed that a young queen is their leader. When one goes off, they all immediately follow, and fly about, seemingly in great confusion, although there is one principle actuating the whole. Sometimes, after hovering in the air a little, they fly away, mount upwards, and go off again with great velocity, till they find a convenient resting-place; such as the branch of a tree, the cavities of old trees, or any other hollow place, suitable to their purpose. Their next business is to make their combs, which they begin directly. Wax is their material; but whence do they procure it? It has commonly been thought from the farina of flowers; but Mr. Hunter suggests a different idea.

idea. He supposes that it is a substance formed within themselves, exuding from the scales of their abdomen, and probably sometimes mixed with farina, as the case requires. The wax in its native state is white, but, when melted from the comb at large, it becomes yellow; arising, as is likely, from being stained with honey, bee-bread, &c. The rows of cells that compose the comb, form perpendicular plates, or partitions, which extend from top to bottom, and from side to side, of the hive. They always begin at the top, and work downwards. The cells are of an hexagonal form, and those designed for holding the young are all of a given depth; whilst the others, reserved for their store, are frequently shallower. One cell is distinguished from the rest, which is called the royal cell. There are sometimes several of these: it is much wider than the others, but seldom so deep. Some suppose that this is designed for the reception of the queen.

As soon as a few combs are formed, the queen bee begins laying her eggs. Her first eggs produce labourers, the next the males, and the last the queen. The eggs are laid at the bottom of the cell, even before it is half completed. Each egg is fastened to the bottom by a gluey matter. In newly-formed combs,
many

many in an unfinished state, the substance called bee-bread is found. After a certain time, the eggs produce maggots, which supply new work for the labourers, as on them devolves the task of feeding and nursing the young progeny. Like many other insects, they cast their coats ; but how often seems unknown. They sometimes remove the eggs, and also the maggots, from one cell to another. When the maggot is grown so large as nearly to fill the cell, it requires no more food, and, being ready to change to the chrysalis state, the bees cover the mouth of the cell, in a convex form, with a substance of a light brown colour. The maggot within is not idle ; it lines the receptacle that contains it with a silk, which forms a case for the chrysalis.

If observation did not teach otherwise, it would be natural to suppose that the labourers would feed the young maggots with honey ; but it is more probable that they are nourished with bee-bread, a substance that they preserve with great care. This is that precious yellow dust that you may have often seen adhering to their legs, of which they despoil various plants, but not without giving preference to some beyond others. It is amusing to see them deposit this treasure in the cell : they are some time in fixing upon a cell ; when they
have

have chosen, they put their two hind legs into it, having the two fore legs and the trunk on the outside of the next cell, and, thrusting down their tail into that they have selected, they then bring the leg under the belly, and, turning the point of the tail to the outside of the leg laden with the farina, they shove it off with the point of the tail, and fly away on another expedition. A fresh bee soon comes, and, creeping into the cell, kneads and works the farina till it is perfectly smooth, and becomes of a consistency like paste.

When the last transformation has taken place, the complete bee destroys the covering of its cell, and issues forth into day-light. At first they are of a greyish colour, but soon turn brown. When the season for laying eggs is over, it is succeeded by that for collecting honey; therefore, when the last chrysalis comes forth, its cell is immediately filled with honey, and, as soon as a cell is full, it is covered over with pure wax, to remain as store for the winter. They provide also a stock of bee-bread, for the young maggots, in the spring.

Having accomplished all their tasks previously to the approach of winter, a scene ensues that marks their economy, but seems to
have

have something of cruelty in it. They will not suffer a useless mouth to partake of their honied store. The males, or drones, are no longer necessary, and are therefore teased to death by the labourers; who do not appear to sting them, but only pinch and pull about these defenceless insects, till they are fairly worn out, and die exhausted by the ill-treatment of their fellow-citizens. Not one is suffered to survive.

The bee is very susceptible of cold, and remains quietly in the shelter of its hive, supported by the provision that is laid up for that dreary season, till the summer calls it forth to fresh labours and enjoyments.

Their enemies are the wasp and the hornet; who are said to open their bodies, in order to suck out the honey. Sparrows have sometimes been seen with one in their bill, and one in each claw. The wax-moth occasionally steals into the hive, and feasts upon their honey.

The Carpenter Bee is so named from its habit of forming long, tubular cavities in wood; the bodies of living trees, or dry-wood, being equally adapted to the purpose. These cavities extend several inches in length, are about the third of an inch in diameter, and are marked into separate spaces, each about three quarters

quarters of an inch long. When this habitation is properly prepared, the insect lines each of these spaces with rose leaves, rolled over each other, the bottom of each being formed by several circular pieces of these leaves, placed over each other till it is of a sufficient thickness. The bee then deposits an egg at the bottom of each division, and, after leaving a proper quantity of a kind of honey, for the nourishment of the young when hatched, closes the top with a lid composed of the same materials as the base, and in the same manner finishes the whole series. This curious operation is mostly performed in autumn. The young bee passes its intermediate states in these retreats, and seldom emerges till pretty late the following summer. These small insects, apparently so feeble and harmless, have been known, with the multitude of these apertures, to have done serious injury to the majestic oak.

Were I to mention every particularity in the history of these interesting insects, I should extend my letter to an unreasonable length; therefore, you must be satisfied with those leading features that I have selected for your amusement, and pursue the curious enquiry by your own attentive observation, and the study of such
 authors

authors as have treated the subject at full length. After hoping that my scholar may become capable of giving me instruction, I shall close my epistle, with subscribing myself
your affectionate

FELICIA.

LETTER

PLATE IX.

3rd. ORDER. LEPIDOPTERA.

- Fig.* 1. Papilio Priamus.
2. Papilio Io.
3. Papilio rurales betulæ.
4. Papilio leitus. *This beautiful insect is a native of Surinam. It flies very rapidly, and generally at great heights in the air. The caterpillar lives on the orange trees, and is green, with a blue head: its body is covered with long and very hard hairs. It changes into a chrysalis in the first days of August, and in about fifteen days afterwards, appears in its perfect or butterfly form.*
5. Sphinx nerii, in its various states.
6. Sphinx atropos.
7. Phalæna grossulariata.
8. Phalæna mori, or Silk-worm, in its various states.

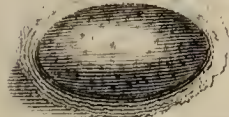


Plate 10.

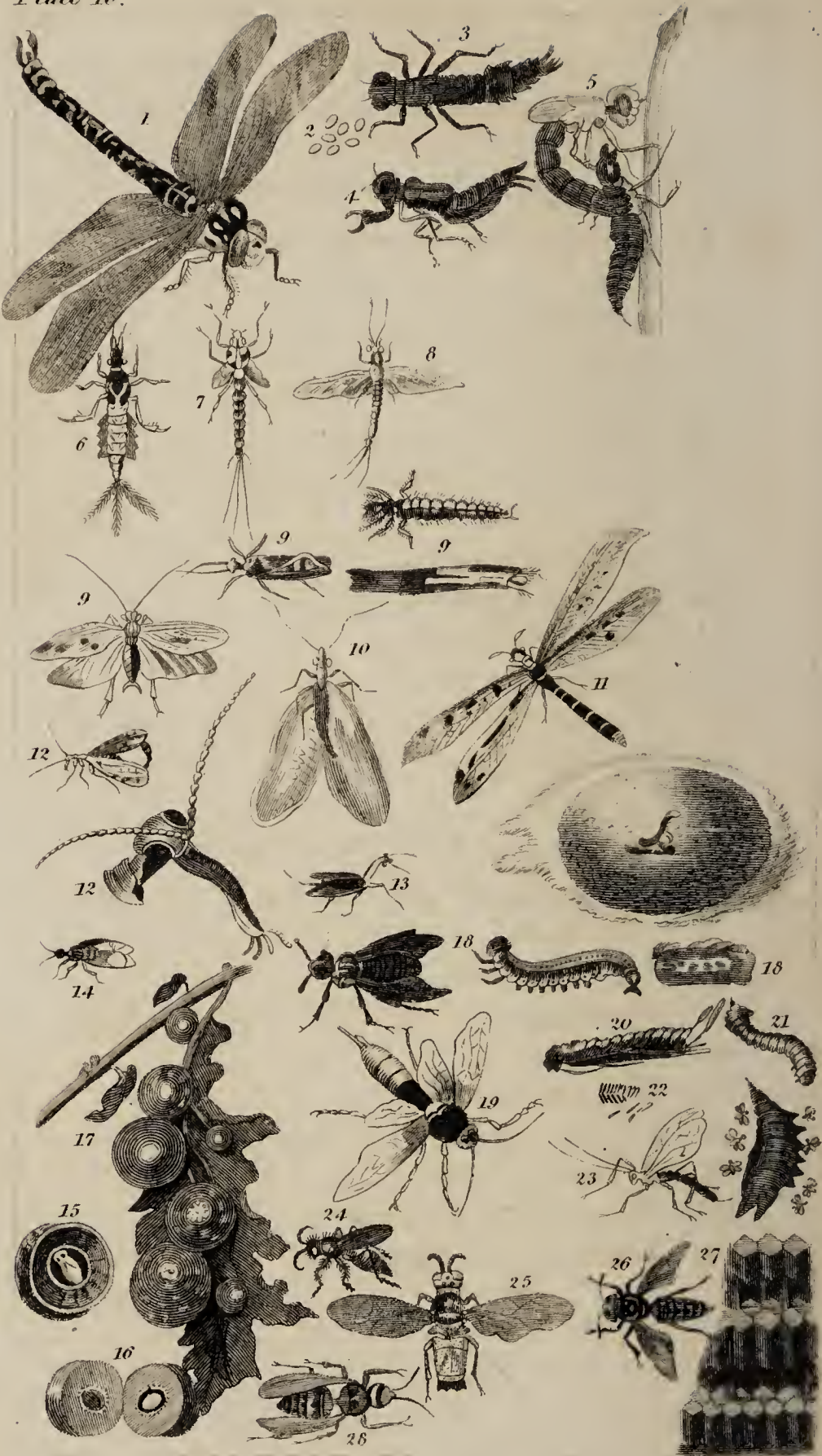


PLATE X.

4th ORDER. NEUROPTERA.

- Fig.* 1. *Libellula varia*, or great variegated Dragon-fly.
2. Eggs of ditto.
3. Larva of ditto.
4. Pupa of ditto.
5. Ditto, quitting the pupa.
6. Larva of the *Ephemera vulgata*.
7. Pupa of ditto.
8. *Ephemera vulgata*.
9. *Phryganea grandis*.
10. *Hemerobius perla*.
11. *Myrmeleon formicaleo*, and nest.
12. *Panorpa communis*, and head magnified.
13. *Raphidia ophiopsis*.

5th ORDER. HYMENOPTERA.

- Fig.* 14. *Cynips quercus folii*. 15. Pupa. 16. Larva.
17. Galls.
18. *Tenthredo lutea*.
19. *Syrex gigas*. 20. Pupa. 21. Larva. 22. Eggs.
23. *Ichneumon luteus*.
24. *Sphex viatica*.
25. *Chrysis ignita*, slightly magnified.
26. *Vespa vulgaris*, or Wasp.
27. The cells of a Wasp's nest.
28. *Vespa crabro*, or Hornet.

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PLATE XI.

Fig.

1. *Apis*, or Bee: trunk magnified.
2. Queen Bee.
3. Drone.
4. *Mellifica*, or Honey Bee.
5. *Formica*, or Ant, neuter, natural size.

6th ORDER.

Fig.

13. Larva of the *Oestrus bovis*, or Ox Gadfly.
14. Pupa of ditto.
15. *Oestrus bovis*.
16. Larva of the *Oestrus equi*
17. *Oestrus equi*.
18. *Tipula rivos*a.
19. *Tipula cornicina*.
20. *Diopsis ichneumonea*, the only species discovered of this genus: about the size of an Ant: found in Guinea.
21. *Musca pendula*, with larva and pupa.
22. *Musca tenax*, foot magnified.
23. Tail of *Musca tenax* magnified.
24. *Tabanus bovinus*.
25. Head of *Tabanus bovinus* magnified.

7th ORDER.

Fig.

41. *Lipisma polypus*.
42. *Podura aquatica* magnified.

Fig.

6. Ant, magnified.
7. Female Ant, natural size.
8. Larva of the Ant.
9. Pupa of ditto.
10. Sting of ditto magnified.
11. Female Ant, magnified.
12. *Mutilla Europea*.

DIPTERA.

Fig.

26. Apparatus within the snout magnified.
27. *Culex*, or Common Gnat, female, magnified.
28. Female Gnat, natural size.
29. Eggs of the Gnat.
30. Eggs magnified.
31. Eggs after hatching.
32. Young.
33. Larva.
34. Pupa, natural size and magnified.
35. Male Gnat, natural size and magnified.
36. *Empis livida*.
37. *Conops calcitrans*, and snout magnified.
38. *Asilus craboniformis*.
39. *Bombylius medius*.
40. *Hippobosca equina*, natural size and magnified.

APTERA.

Fig.

43. *Podura arborea*, with an under view of the tail magnified.



Plate 12.



PLATE XII.

- Fig.* 1. *Termes arborum*, male. 2. Labourer. 3. Soldier. 4. Female.
5. Crow-louse, magnified.
6. Flea-egg. 7. Larva. 8. Chrysalis. 9. Flea, magnified.
10. Cheese-mite, magnified.
11. *Hydrachna geographica*.
12. *Phalangium reniforme*.
13. *Aranea diadema*.
14. *Scorpio afer*.
15. *Cancer Bernardus*.
16. *Monoculus Polyphemus*.
17. *Monoculus pulex*, natural size and magnified.
18. *Oniscus armadillo*.
19. *Scolopendra electrica*.
20. *Julus sabulosus*.

LETTER XIII.

*FELICIA TO CONSTANCE.**Shrubbery.*

DEAR SISTER,

“GO to the Ant, thou sluggard ; consider her ways, and be wise : which having no guide, overseer, or ruler, provideth her meat in the summer, and gathereth her food in the harvest.” This was the advice of the wise Solomon, and might possibly be appropriate in that part of the world where he resided ; but the naturalists of later times have discovered, that, in our climate, ants do not lay up a winter store. It is supposed, by Leewenhoek, that they lie dormant, and do not eat at all in the winter ; and that the provision they collect is intended as a present supply for their young, rather than for themselves.

The insects of the genus *Formica*, or Ant, like that of the bees and wasps, are divided into males, females, and neuters, each being destined to similar employments. The males and females are provided with wings, and enjoy all

the pleasures of a wandering life; while the neuters, or labourers, destitute of wings or sex, labour continually for the good of the colony, in forming their habitation, which may be compared to a well-regulated republic. It is always made in a stiff soil, at the foot of a wall or tree, exposed to the sun, and consists of one or several cavities, in the form of an arched vault, hollowed out with their jaws. Each has its task assigned him: one casts out the mould, whilst another is foraging abroad to collect provision for the community. Animal or vegetable substances are equally acceptable to them, as they willingly eat either the smaller kinds of insects, or different fruits. Their appetite for animal food has rendered them useful to anatomists, who, when they wish to obtain the skeleton of any animal too small to admit of being prepared in the usual way, have availed themselves of their carnivorous disposition, by placing it in a box perforated with holes, in the midst of an ant-hill, where the fleshy parts are presently consumed. Very elegant skeletons of frogs, snakes, &c. have been obtained by this means.

Though they do not lay up winter stores, their economy is very curious. The eggs of the Common, or Black Ant, are white, and extremely small. From these are hatched the larvæ,

larvæ, which are of the same colour, of a thickish form, and destitute of legs. In that state they are vulgarly and erroneously called ants' eggs, and afford excellent nourishment to young turkeys, pheasants, partridges, &c. The care of these maggots devolves upon the labourers, who not only feed them, but frequently change their situation; bringing them nearer to the surface, for the sake of warmth, or placing them lower, if the weather requires it. When the larvæ have attained their full growth, they enclose themselves in smooth, oval, yellow, silken webs. Early in autumn, the males and females may be observed in the nests. The female far exceeds the male in size, having very long upper wings. At this season both sexes emigrate, and fly to a considerable height. The males survive but a little time; whilst the females return to the nest, to deposit their eggs for a future progeny.

Some species are armed with a sting; others are without. There are several species of them, and though, to an inaccurate observer, they have a near resemblance to each other, each family keep themselves distinct, nor will they suffer the intrusion of a stranger.

Colour seems to vary with climate and circumstances. Bruce relates, that, in the vicinity of the Red Sea, he observed the ants that were

creeping on the mountains of purple porphyry, were of the same colour; a peculiarity bestowed upon them for the benevolent purpose of concealing them from birds, or some other enemies.

The last genus in this order is that of *Mutilla*. Their habits have a great affinity to those I have just described; but they are larger, and their colours are more lively. These beautiful insects are inhabitants of the ground, and are to be sought under the moss, where they love to conceal themselves, when they find a hollow space beneath it. They are swift in motion, and their wings shine like pearls. But some of them are without wings, which probably marks the distinction of sex. They are said to live together in small communities.

The sixth order, DIPTERA, presents a race of insects that have two wings, and two poisers; the first genus of which is *Oestrus*, or Gad-fly. Various are the substances from which instinct directs the minute tribe of insects to select a nidus for their young. We have already seen that the *Ichneumon* deposits her eggs in the bodies of living insects; the *Sphex* in those of dead ones, while the *Oestrus* inserts hers in different parts of the bodies of quadrupeds, confining her operations, with curious skill, to those parts only that will an-

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swer her purpose. For the performance of this task, Nature has furnished her with a whimble of wonderful structure, fixed in the hinder part of the body. This whimble is a scaly cylinder, composed of four tubes, which draw out like the pieces of a spying-glass. The last is armed with three hooks, and is the gimlet which enables this small insect to bore through the tough hides of horned cattle.

The principal European species is the Ox Gad-fly, which is about the size of a common bee, and of a pale yellowish brown, marked with dusky streaks. The female, when ready to deposit her eggs, fastens on the back of one of the horned tribe, and, by means of her whimble, lays an egg in the skin, repeating the same operation on many parts of the animal's back. It may be presumed, from the dread that cattle betray on the approach of this minute enemy, that the pain is acute: but vain is their attempt to escape their tormentor, unless they have an opportunity of betaking to some piece of water: in this situation they are seldom attacked. The egg being hatched, produces an oval maggot, of a yellowish white, that, as it increases in size, causes swellings beneath the skin of the ox, which enlarge till they are nearly an inch, or more, in diameter.

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When full-grown, the larva breaks through the tumour, and slides down to the ground in the cool of the morning: it then digs itself a burrow, into which it retires. The larva skin becomes hard, and turns to a kind of solid shell. In this case the insect is transformed to a chrysalis, and afterwards to a winged fly. It would be almost impossible for the fly to escape from this strong enclosure, had not Nature made a curious provision for the purpose, there being a small valve at one end, fastened only by a very slight filament, which, on the first push made by the Gad-fly, opens without difficulty.

The different kinds of animals are attacked by distinct species of the Gad-fly. That which farriers call Bots, is peculiar to the horse. The precaution of the parent insect for the future welfare of her young, deserves a minute account. When she has fixed upon a horse suited to her purpose, she approaches it on the wing, and holding her body nearly upright in the air, with her tail curved inwards, she suspends herself for a few seconds in that position, then suddenly darts upon the selected spot, and leaves her egg adhering to the hair, to which it is fastened by a glutinous liquor. This is repeated by a number of flies, till four or five hundred eggs are sometimes placed on
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one horse. The horse, when accustomed to these attacks, seems scarcely aware of the injury it must sustain from its insidious enemy; for, instead of placing her eggs promiscuously, as an inaccurate observer might suppose, she invariably places them on those parts which are most liable to be licked with the tongue. The eggs, after having remained on the hairs four or five days, the slightest application of warmth and moisture is sufficient to bring forth the imprisoned larva; therefore, on the touch of the horse's tongue, a small, active worm is instantaneously produced, and adhering to it, is conveyed with the food into the stomach. These larvæ attach themselves to every part of the inside, and are often found in the intestines; and are probably as injurious to the health of the horse, as worms are to the human constitution. They attain their full growth about the latter end of May, and are dropped from the horse from this time till the latter end of June: they then seek a retreat, in which they become chrysalids, and in about six weeks are transformed into flies.

The Sheep Gad-fly is a terrible tormentor to that harmless race of quadrupeds, by inserting her eggs in their nostrils, where they become grubs, and feed on the mucous matter they find there. The sheep dread their enemy,
become

become restless and agitated on their approach ; and in order to avoid its attacks, they are frequently seen, in the middle of a hot day, crowded together on dry, dusty places, with their noses held close to the ground, that the flies may not be able to get at them.

The enterprising and pious traveller, Mr. Bruce, describes the formidable effects of an African fly, called Zimb, which, from its habits, probably is a species of this genus. He remarks, that, in appearance, it is weak and contemptible; yet, in its consequences, more formidable than large herds of the most ferocious animals. As soon as this fly appears, the cattle, alarmed by the sound of its buzzing, forsake their food, and run wildly about the plain till they die, worn out with fatigue, alarm, and hunger. The shepherd has no remedy to secure his flocks from the attacks of this devastating insect, which produces large bosses, swellings, and putrified sores, all over the body of the animal, which prove its certain destruction, but to abandon the rich plains, and hasten with his charge to the sands of Atbara, where his cruel enemy never dares to pursue him. The prophet Isaiah, continues Mr. Bruce, has given a most striking description of this destructive insect: “And, it shall come to pass in that day, that the Lord shall hiss for
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the fly that is in the uttermost part of the rivers of Egypt; and they shall come, and shall rest all of them in the desolate valleys, and in the holes of the rocks, and upon all thorns, and upon all bushes." *Isaiah*, chap. vii. ver. 18, 19. The same writer accounts for the separation of the Israelites and the Egyptians at the time of the plagues; particularly relating to that of the fly inflicted on the latter, by the limits prescribed by Providence to this insect, that confined it to the black earth of the valley of Egypt, which had been overflowed by the Nile. Thus we see that the Supreme Being is never at a loss to bring about his designs, and that the most powerful of his creatures can never exceed the bounds that he has ordained. Lest I should extend my letter too long, I shall defer the other genera of this order till another opportunity, and am, with sincere affection, yours,

FELICIA.

LETTER XIV.

*FELICIA TO CONSTANCE.**Shrubbery.*

DEAR CONSTANCE,

A RAINY morning having deprived me of my walk, I cannot employ the leisure opportunity more agreeably, than in writing to you; and shall continue my entomological descriptions, by introducing to your notice the genus *Tipula*, which bears a near affinity to that of the gnat tribe. The larger kinds are generally distinguished by long, slender bodies; expanded wings; and legs of unusual length, which are so frail and tender, that the insect can scarcely be handled without breaking them. The larvæ of the different species vary much in their modes of life; some being terrestrial, and others aquatic. They feed on the softer kinds of vegetable substances. The largest of the European kinds, is the *Tipula rivosæ*: this is our old acquaintance, Father Long-legs, which has so often distressed us, by flying into the candle, notwithstanding all our endeavours to preserve it from such a painful death. It proceeds

from a greyish larva, destitute of legs, which is found beneath the roots of grass, in meadows, gardens, &c. This larva changes into a lengthened and pointed chrysalis, out of which a complete insect emerges in September. The chrysalids of both kinds are furnished with two small curved horns, through which they breathe, and are endued with a progressive motion; but cannot move backwards, being prevented by little spines placed on every ring of the abdomen.

The *Tipula crocata* is one of the few insects of this genus, adorned with lively colours: it is of a polished black, and the body encircled with golden rings. The larva is found in the stumps of decayed trees, and the perfect insect is often met with in meadows.

You may have observed great numbers of minute flies sporting on the windows in a summer's evening, which, probably, you have mistaken for gnats: they are the *Tipulæ phalænoides*, and when examined in the microscope, their wings deeply fringed with hair, and the nerves beset with scales or feathers, make a very elegant appearance. Some of the smaller kinds flutter about the water-side in a summer's evening, in prodigious numbers. In the larva state many of them are a prey to fishes; when
they

they acquire wings, they are equally exposed to the rapacity of birds.

The next genus is that of *Musca*, or Fly, and its species are so numerous, as to render it necessary to assort it in different divisions. The principal of these are distinguished by the form of the antennæ, which are either simple, or furnished with a plume. These are again subdivided into such as are more or less downy. The Fly is the most common of all insects, though the habits of the different kinds vary exceedingly, more especially in the larva state; some of which inhabit the earth, others the water. Those of the more common kinds, are generally known by the name of maggots, and spring from eggs deposited on putrid substances of different kinds. Several of the aquatic species are curiously formed for their mode of life, and display striking examples that the great Creator has provided for the accommodation and enjoyment of the meanest of his creatures. Some inhabit vegetables, and feed on other living insects, particularly the aphides. These larvæ seem to want eyes, and seek their prey by lengthening their head. The mouth of the perfect *Musca*, is formed by a soft, fleshy proboscis, with two lateral lips, and has no palpi.

The *Musca cameleon* is a large, black fly,
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of a flattish shape; its head greatly resembles that of the *Oestrus*, and the eyes occupy the greatest part of it. The larva of this fly dwells in fresh water, and the perfect insect walks upon the surface. The female places her eggs in the hollow stalks of aquatic plants, so securely, that they cannot easily be carried away. From this egg proceeds a larva of a singular structure, that may be often seen crawling on the grass, near shallow, standing waters. The tail has a verge of hairs, which, when expanded, supports the insect on the surface, with its head downwards. When it is its wish to descend, it contracts the hairs into the form of a bell, or sometimes entirely closes them; if it have occasion to rise again, it forces a bubble from a small opening in the centre of the tail, which immediately has the desired effect.

In the first division also, is found the *Musca vermileo*, a middle-sized fly, of rather a lengthened form, and of a dull yellow, with transparent wings. It inhabits the southern parts of Europe, and forms a circular pit to entrap its prey, in a similar manner to that of the ant-lion.

Amongst those flies that are downy, with bristled antennæ, may be remarked the *Musca tenax*. The larva is a long-tailed, brown maggot, frequently found in muddy, stagnant waters,

waters, drains, and other places of the dirtiest description; and though uninviting in its first appearance, deserves an accurate examination, from those who love to observe the contrivances of Nature. It has seven feet on each side, which are curiously adapted to enable the insect to ascend perpendicular walls, &c. in order to seek a proper situation for its transformation into the chrysalis state. These feet are very broad, and thickly beset on their under side with small, hooked claws, with which it clings to the surface, without danger of falling.

The *Musca pendula* is black, with bright yellow stripes. Its larva inhabits stagnant waters, and is furnished with a long tail, that the creature can extend at pleasure, terminated by a very small air-hole. The length of this tube is varied according to the depth best suited to the inclination of the insect, the tip reaching to the surface, to supply the requisite quantity of air. The complete insect is frequently seen on flowers, during the autumnal season.

The common large Blow-fly ranks among the hairy or bristly flies. The eggs being laid in animal flesh, the maggots are hatched in the space of a few hours, and are eight or ten days in acquiring their full size. When it changes
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to a chrysalis, the skin dries round it, and it assumes an oval form, of a reddish colour, which, in ten days more, produces the perfect fly.

The fourth genus is *Tabanus*. These insects are nourished with the blood of horses and cattle. During the summer heats, especially in the middle of the day, they are extremely troublesome, piercing the skin of large animals with the lancets of their trunk, in order to suck the blood; which causes such intolerable pain, that the cattle gallop about as if they were distracted. They abound most in damp woods and meadows. The largest of the British species is the *Tabanus bovinus*, or great Horse-fly. It is sometimes an inch long, and is of a greyish colour, marked down the back by a row of white, triangular spots.

The *Tabanus pluvialis* is about the size of a window-fly, of a dullish brown, the wings marbled with numerous whitish specks; and is a troublesome companion in autumn, particularly on the approach of rain, as it bites any part of the flesh which is uncovered.

The different species of that tormenting insect, the *Culex*, or Gnat, form the next genus. Their larvæ are very frequent in standing waters. Nine segments, diminishing in size and length from the head downwards, compose their

their bodies. From the last of these sections, proceeds a kind of stigmata, or projection, through which the insect breathes, frequently rising, for the sake of fresh air, to the top of the water. Its motions are very lively, darting, with great swiftness, in different directions. It feeds on the minute vegetable and animal particles, which it finds in great plenty in the stagnant waters. The head is armed with hooks, which serve to seize its food. On the sides are placed four small fins, which enable it to swim or dive at pleasure. In about three weeks, they are transformed to chrysalids; and, in a few days, exchange that state for a perfect gnat. What a transformation! A moment before, water was the element of the little creature; but now, having acquired wings, it can no longer subsist in it. If, at the instant the gnat emerges from his confinement, from which he is not yet entirely loosened, a breeze arises, he, like an unfortunate mariner, sinks with his frail vessel, and perishes in that water, which was, a few moments before, necessary to his existence.

It is impossible to behold, and not admire, the amazing structure of its sting! It is a tube, containing five or six spiculæ, extremely minute; some toothed at their extremity, like the head of an arrow, others sharp-edged, like

RAZORS.

razors. These *spiculæ*, introduced into the veins, act as pump-suckers, into which the blood ascends, from the smallness of the capillary tubes. The pain and inflammation are caused by a fluid ejected by the insect. The female deposits her eggs on the water, in groups of two or three hundred, placed together in the form of a boat. The gnat is supposed to feed both on animal and vegetable juices: but it is likely that the latter are its chief nourishment; as Reaumur observes, that of the millions on millions which swarm in marshes and swamps, it is probable that not one in an hundred has an opportunity of tasting blood.

Of all the European nations, Lapland is the most incommoded by the noxious bite of these vexatious insects; so that the poor inhabitants scarcely dare go abroad, without first smearing their hands and faces with a mixture of tar and cream. But, as every evil in nature is compensated by some advantage, so in the present case; for the myriads of gnats that swarm in these regions, with their *larvæ*, that inhabit the lakes, supply nutritious food to the innumerable multitudes of aquatic birds, which, in their turn, are consumed by the natives.

The Musquito, whose bite, in warm climates, is not only troublesome, but sometimes dangerous,

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rous, is supposed to be no other than a variety of the common European gnat.

Cattle are subject to the attacks of several kinds of insects. You have already seen that the *Oestrus* and the *Tabanus* injure them with impunity. We shall now perceive that they are equally liable to the attacks of several other kinds; one of which, the *Conops*, is beneficial to them, in the judgment of Linnaeus, by inducing a continual motion; and by this means preventing them from the ill effects of indolence and repletion.

One of these genera is the *Empis*, which has some affinity in its habits to the *Tipulæ* tribe. The *Empis livida* is a brownish fly, with transparent wings. It frequents fields and gardens, and has been known to inhabit the ears of rye, in some parts of Sweden, by which the country people supposed that the crops were injured; but, as they feed principally on the smaller kinds of flies, it is more probable that they were serviceable to the corn, by ridding it of noxious insects.

Amongst the species of the genus *Conops*, is the *Conops calcitrans*, so extremely like the common window-fly, that it is frequently mistaken for it; but attentive observation will clearly distinguish it, by its strong, pointed proboscis, stretching forward from a joint at its
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lower part. The attacks of this insect, in autumn, are very troublesome, both to man and beast; from both which it sucks blood with its proboscis.

The succeeding genus, *Asilus*, is nearly as long as a hornet, but of a more slender shape; and though of a formidable aspect, is incapable of causing much pain. It preys on the smaller insects, and proceeds from a smooth, yellowish white, subterraneous larva, without legs. The larger species is found in the northern parts of Europe; especially in Lapland.

The genus *Bombilius*, or Buzz-fly, has a resemblance to the smaller kinds of humble bees, being thickly covered with upright, downy hair. They fly swiftly, and are in the frequent habit of hovering over a flower without settling; vibrating their wings, as if uncertain in their choice, and darting suddenly off upon the slightest disturbance. The most familiar species is often seen in spring, in gardens and fields, and may be easily known by its downy, bee-like body, and its straight, sharp-pointed proboscis.

The last genus of this order is the *Hippobosca*. Amongst those of the European kinds, there are but few species: that of the *Hippobosca equina*, or Horse-fly, is the most common. It sucks blood from horses and cattle,
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and irritates them greatly by the pain it causes. The female deposits a single egg at distant intervals, which may more properly be termed a pupa, than an egg, as the perfect insect emerges from it; which is a peculiarity not hitherto remarked in any of those insects we have examined.

The *Hippobosca avicularia* is of a smaller size, and of a dull green colour. It infests the bodies of birds, in a very troublesome manner. Another species is the peculiar inmate of swallows, swifts, and martins, and may almost always be found in their nests.

The Sheep-tick, so frequently seen embedded in the wool of those animals, is of this genus. Its colour is a reddish brown; and it differs from the rest of its congeners, in having no wings. All of this genus are remarkably tenacious of life: the sheep-tick, in particular, appears uninjured after remaining a long time in packed fleeces.

I shall now lay aside my pen, and, as sunshine succeeds the shower, prepare for a walk. Adieu.

FELICIA.

LETTER.

LETTER XV.

*FROM FELICIA TO CONSTANCE.**Shrubbery.*

DEAR CONSTANCE,

WE are now arrived at the last order, *APTERA*, the characteristic of which is, that the insects of both sexes, which compose it, are without wings; though we shall find exceptions to this rule. The instincts of some of the genera are surprisingly curious; but several of them are amongst the most loathsome and disgusting of those insect tribes which humiliate the pride of man, and, at the same time, excite his industry, by enforcing the necessity of the strictest attention to cleanliness.

There are but few species of the first genus, *Lepisma*, the chief of which, known in our own country, is, from its tapering form and silvery hue, called the Wood-fish. Its pearly appearance arises from a covering of extremely minute, oval scales, which are nearly transparent, and brushed off with a touch. The
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motions of this creature are remarkably quick; and, if we examine our stores of sugar, it is not improbable that we may find some of them among it. It has been suspected of destroying books, but it seems doubtful whether it deserves such opprobrium.

The *Lepisma polypus* is of a dusky brown, and, if disturbed, has the power of leaping. It is found on the sea-coasts of many northern regions, under stones, and such-like substances.

The *Podura*, or Spring-tail, forms the second genus. These insects generally lurk in damp places, in sand or gravel pits, under stones or the bark of trees: and one species leaps upon the surface of the water, with great agility, being furnished with a long, forked process, which is doubled under the abdomen, and answers the purpose of a spring.

The *Podura aquatica* is not uncommon, and is entirely black. It is a small, gregarious insect, and may frequently be seen, assembling in thousands, on the banks of pools, ponds, and reservoirs; and sometimes ventures even on the surface of the water. This concourse of living insects, on a slight view, has the appearance of grains of gunpowder; but, on a closer examination, their continual skipping motion will convince the spectator that they
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are animated beings. Another species resembles this exactly, except in colour, which is a pure white, and is equally the inhabitant of damp situations.

The third genus, *Termes*, is the most interesting of any in this order, from the curious arrangement of its interior discipline, and the well-contrived structure of the habitations it forms, for the preservation of its young, and the security of its stores. The surprising policy observed by this minute insect, has some resemblance to that of bees, wasps, ants, and other insects that live in communities; but from the accounts of Mr. Smeathman, recorded in the *Philosophical Transactions*, who bestowed much observation upon their habits, in different parts of Africa, it appears that the *Termes* excels them all. The variety that Nature displays in every part of her works, is very striking in the different contrivances, or instincts, bestowed on these various tribes of insects, to effect the same purposes. The nest of the bee, the wasp, and the ant, have long been the theme of admiration, for their neatness, beauty, order, and regularity; but we shall find that those of the Termites are constructed with still more art, and that the structure is occasionally varied, to adapt itself to circumstances.

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These insects abound throughout the torrid zone; and their nests, or hills, are of such magnitude, and so numerous, as, in some parts, to give the appearance of a group of huts belonging to the natives. They are of a conical form, often rising to the height of ten or eleven feet; and, when covered with grass, which, in the dry season becomes brown, they may be mistaken for a very large hay-cock. Before I describe the interior of this erection, it may be necessary to give you some account of its inhabitants. Each community consists of three orders, which are, in reality, but different states of the same insect. The first state is that of the labourers, or working insects, which are always the most numerous: they are then about a quarter of an inch long, and are less than our ants; to which they bear some resemblance, and, on that account, have been improperly called White Ants. From their fondness for wood, they have likewise been distinguished by the name of Wood-lice. In the second state, they assume a very different form, and are then called soldiers. Having now no longer any other employment, than that of defending the community from the attack of an enemy, (an office to which their new construction is admirably adapted,) their size is increased nearly double; and the head
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and mouth, which before were calculated for gnawing and holding bodies, are converted into two jaws, placed in a strong, horny head, shaped like jagged, sharp awls, designed to pierce or cut; for which purpose they are as hard as a crab's claw, and inflict a painful wound, fetching blood wherever they bite.

The next metamorphosis is still greater; the head, thorax, and abdomen, differ almost entirely from the same parts in the labourers and soldiers; and the change is rendered still more striking, by the addition of four fine, large, brownish, transparent wings; which has made some naturalists think they should have been arranged in the order Neuroptera, instead of that of Aptera. This remarkable alteration takes place just before the rainy season begins.

In their former state, it is not easy to distinguish that they have any eyes, having but little occasion for them whilst they live underground; but no sooner are they destined to wander through the air, than they are furnished with two very large ones.

The disposition is now as much changed as their figure: from being one of the most active, industrious, and fierce animals of their size, they become the most innocent, helpless, and cowardly, having no means of resistance

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against their numerous enemies. Their numbers make some amends for the vast destruction the race undergoes. It often happens, after the first tornado, that the surface of the earth, and even the waters, are covered with them; yet, in a few hours, scarcely one in a thousand is to be found, that has not lost one or more of its wings. And it is probable, that not more than one pair in several millions, escapes the pursuit of ants, birds, reptiles, or men; for in Africa they form an article of food. A few, however, are preserved in safety, to lay the foundation of new colonies. A pair of these being found, by some of the labouring insects that are wandering about the surface of the ground, they hail these fortunate ones as their king and queen, and prepare for their security, by immediately enclosing them in a small chamber of clay, adapted to their size; leaving, at first, but one small entrance, just large enough for themselves and the soldiers to pass, but much too small for either of the royal pair to escape: and, when occasion requires it, they increase the number of the entrances, but not their size. So that the same instinct which directs all creatures to the preservation of their kind, incites these labourers to voluntarily undertake the task of providing and defending the parents of a future progeny.

The

The queen *Termes*, like the queen bee, is the mother of the whole community; and, about this time, undergoes a most extraordinary change, in the form and size of the abdomen, which enlarges so prodigiously, that, in an old queen, it will be equal in bulk to twenty or thirty thousand labourers. This receptacle of eggs, previously to this change, was only about half an inch long, and, in the space of two years, sometimes increases to the length of six inches. Its amazing extension is not its only remarkable quality; for its continual motion resembles the undulating of waves, and causes the protruding of eggs, at the rate of sixty in a minute, or eighty thousand in twenty-four hours. The labourers, like the neuters in a bee-hive, move these eggs as soon as they are deposited, and carry them to apartments, which I shall call the nurseries. As soon as the eggs are hatched, they nurse the young with tender care, and supply all their wants, till they are able to take their share in the labours of the community. This account applies particularly to the *Termes belicosus*.

It is now time to take a view of the interior of one of their vast nests. Each of these buildings has an outward covering and interior apartments. The exterior is one large shell, formed like a dome; large and strong enough

to shelter the inner parts from the vicissitudes of weather, and its inhabitants from the invasion of natural or accidental enemies. The interior contains a great number of separate cells, for the residence of the king and queen, the young progeny, and magazines for stores and provisions. The chamber appropriated to the king and queen, is a principal object of their care; being of an oval shape, and placed near the centre of the building. At first it is not above an inch in length; but it is increased in size, in proportion as the bulk of the queen enlarges; who, as we have already seen, in due time requires a cell of much larger dimensions. To make it complete, it is covered with a solid, well-turned, oval arch. This chamber is surrounded by innumerable others, of different sizes and shapes, but all of them arched. Beyond these are the magazines and nurseries: the former are made of clay, and are always well filled with provisions; which appear like raspings of wood and plants, but are found to consist of the gums or inspissated juices of vegetables. The nurseries are entirely different from the rest of the apartments, being composed of wooden materials, joined together with gums. These are invariably occupied by the eggs, or young ones: the latter, when first hatched, are as white as snow.

It

It is extremely amazing, as well as curious, to observe the progress of one of these cities. The first appearance above ground, is one or two small turrets, shaped like sugar-loaves, about a foot high. As the work advances, the number of these turrets is increased, till the base of their hill is entirely covered with them. The highest and largest is in the centre; and, by filling up the intervals between them, they form, as it were, one dome. When this cupola is completed, they take away the middle turrets, except the tops, which serve as props to the building, and apply the clay to other purposes. The use of the outward shell is not only to protect the interior from violence and heavy rains, but to collect a degree of genial warmth, which promotes hatching the eggs and cherishing the young.

Thus they frequently enlarge their apartments, and change their situation; pulling down and rebuilding, as their wants require, with an apparent design and foresight, superior to the general instincts of other insects. The interior building has a flattish top, without any opening; which would preserve the inner chambers from wet, in case of the outer ones being penetrated by rain. The nurseries are enclosed in chambers of clay, and, at the commencement of the building, do not exceed
a hazel-

a hazel-nut in size; but, in a great hill, are often of a considerable magnitude. In the multitude of apartments, some contrivance is necessary to facilitate the communication with the distant parts of the nest; accordingly, they build a kind of bridge, of one vast arch, which answers the purpose of a flight of stairs, from the floor of the area to some opening on the side of one of the columns which support the great arches, and diminishes the fatigue of those labourers, to whom the task is assigned of carrying the eggs from the royal chamber to some of the upper nurseries.

Their labours are not entirely confined to the interior of their hillocks, but they carry out large subterranean passages, in various directions, and to a great extent. Mr. Smeathman measured one of them thirteen inches in diameter. These subterranean passages or galleries, are thickly lined with the same kind of clay of which the hill is composed, and ascend the inside of the outward shell in a spiral manner; winding round the building till they reach the top, and intersecting each other at different heights, open into the dome or the interior building. From every part of these large galleries, various smaller ones proceed, and form a communication with the different parts of the building. Many of them descend

descend three or four feet perpendicularly among the gravel, from which the labouring Termites collect the finer parts, and working them up in their mouths, convert them into a kind of mortar or solid clay, of which their hills, and all their buildings except their nurseries, are composed.

It is difficult to give a European an idea of the ravages these little creatures occasion : they destroy every substance that can be penetrated by their sharp forceps. They will devour the whole inside of large trees that are beginning to decay ; eat through floors ; or consume the internal parts of the props of houses, so that the roofs would fall in, were it not for a most extraordinary instinct that prompts them to prevent this ruin to themselves, by filling the cavities they have made with their own mortar ; so that the supports of the house, which were wood, become, in effect, stone. No caution is sufficient, in hot climates, against their depredations. But though so injurious and troublesome, let us not suppose that they do not compensate for their rapacity, by contributing powerfully to the health and comfort of man, by destroying putrid substances, which, in these sultry climates, if left to the gradual progress of natural decay, would produce the most baneful effects.

There

There are several species of them; some of which build upon the surface of the ground, whilst others form their habitations on the stems or branches of trees, at a vast height.

The European species do not appear to live together in numbers, but are usually found alone. The most common of these is the *Termes pulsatorius*, a diminutive, white insect, that, during the summer months, frequents houses, and is often found in old wainscots, where it causes dismay to the ignorant and superstitious, by a long-continued sound, exactly resembling the ticking of a watch, which they consider a prognostic of death. It infests collections of dried plants, and is very injurious to them. When viewed in a microscope, the eyes appear large, and are of a most beautiful gold colour, divided into innumerable six-sided lenses.

The unusual length of this letter, renders any apology for concluding it unnecessary; therefore, I shall only say adieu.

FELICIA.

LETTER

LETTER XVI.

*FELICIA TO CONSTANCE.**Shrubbery.*

DEAR CONSTANCE,

THE next genus, *Pediculus*, presents a variety of insects that are the annoyance of man, beasts, birds, and even insects themselves; each race of creatures owning one or more species peculiar to their kind, and proving that animated beings teem in every part of nature. You will easily perceive that I am speaking of the Louse, a creature I would willingly have passed in silence, could I have done so without rendering my work incomplete. I shall, at any rate, avoid a description of a creature that you may have seen, though with disgust. It will be sufficient to say, that those which lurk in the hair, are harder and higher coloured than such as prey upon the other parts of the body.

This noisome insect proceeds from the egg complete, and multiplies in a most rapid proportion. From the experiments of Mr. Lewenhock, a calculation has been made, that in

eight weeks a single female would produce five thousand descendants! These humiliating insects have always been esteemed a kind of pest, and are generally supposed to be the ill consequence of personal negligence; and of course abound more in the habitations of poverty, where a scanty supply of linen, and the want of other comforts, generate filth. But there are also several memorable instances recorded, both in sacred and profane history, of persons of the highest rank, possessing every accommodation that cleanliness can supply, having been so much infested by these creatures, as to have suffered fatal effects from them; nor could any means be devised to destroy them, and save the sufferer from such an odious death.

The genus *Culex*, or Flea, succeeds, and though very troublesome and disagreeable, is not quite so odious as the last mentioned. The eggs are very small, of an oval shape, white colour, and a polished surface. In six days these produce a worm-shaped larva, beset with distant hairs, and furnished at the head with a pair of short antennæ, and at the tail with two curved forks, but are wholly destitute of legs. Pigeons' nests, and those of other birds, are the receptacles often chosen by the parent for her eggs, where the larvæ find a rich supply of food in the blood of the young ones. In
less

less than ten days they reach their full growth, when they cast their skin, and assume the state of a chrysalis, in which immature limbs are plainly discernible. Before they undergo this change, the larvæ sometimes enclose themselves in an oval, cotton-like covering. In about the same space of time, the chrysalis undergoes its last transformation, when the complete flea exerts its active powers, and feasts upon the first animal to which it can gain access. It prefers the delicate flesh of women or children, and is observed to avoid that of sick persons. This insect is remarkable for the unusual situation of the two fore-legs, which are placed immediately beneath the head. The antennæ are short, hairy, and consist of five joints. Beneath these is the proboscis, which is a strong, sharp-pointed tube, fixed between a pair of jointed sheaths, rendered still stronger at the base by a pair of pointed scales. The eyes are large, round, and black. The high polish of the shelly armour, which is at once a security and a covering, is admirable. The flea loves to nestle in the fur of dogs, cats, rats, &c. It has an astonishing power of leaping, in proportion to its size, which is effected by the elasticity of its feet, the articulations of which act like so many springs.

The family *Acarus*, or Mite, forms the next
genus,

genus, and is composed of many species, equally troublesome to the animals they infest; whether it be the *Acarus autumnalis*, or Harvest-Bug, that intrudes itself under the skin of a human being; or the *Acarus coleoptratorum*, that torments the common black beetle sometimes in such numbers as to occasion its death. Most of the insects of this genus are very minute; but some are of considerable size, particularly the Tick, which is frequently seen on dogs, and occasionally on cattle, where they adhere closely to the skin by means of a strong, broad, flat-shaped proboscis, edged with sharp prickles. Other contrivances, admirably adapted to the same purpose, though varying according to circumstances, are bestowed upon the different species, most of which fix themselves tenaciously to the skin of some animal, and sometimes get beneath it; as in the case of that loathsome disorder the itch, which is supposed to arise from a very minute species of mite, that breeds and multiplies in great numbers under the skin.

Two kinds annoy the black beetle: one of them, *Acarus vegetans*, confines itself to the limbs or wing-shells of the beetle, to which it is fixed by a sort of long tail, resembling a foot-stalk, from whence it has derived its name.

The

The Cheese-mite, though small and insignificant to the naked eye, is a curious object in the microscope. When the parts are magnified, it appears that the body is thickly beset with bristles, that are barbed on each side with sharp-pointed spikes, like an ear of barley. Mites are hatched from very small, white, oval, eggs, and undergo no other transformation but changing their skin, by which a fourth pair of legs is developed, that before was not perceptible. Lewenhoeck relates, that he glued one of these little creatures to a pin, which he placed before his microscope, for the purpose of observation; and it lived in that situation, without food or motion, eleven weeks, though, when at liberty, it is voracious, feeding greedily on whatever comes in its way, whether of an animal or vegetable nature. It seems as if tenacity of life increased in proportion to the low scale of organization and intellect; so that the more noble the creature, the easier it is destroyed. The acuteness of feeling probably diminishes in the same ratio; a sentiment consoling to humanity, as the smaller and weaker animals, such as fishes, reptiles, and insects, are often treated with a degree of contempt and cruelty, that is suited only to creatures devoid of sensation; proceeding, in many instances,

stances, from want of reflection, rather than a malicious design to torment.

The genus *Hydrachna* has a close affinity to the last mentioned. It consists chiefly of small insects, the largest not exceeding the size of a pea, of a flat, globular shape, that inhabit stagnant waters, and are very quick in their motions.

The *Hydrachna geographica*, so named from the fancied resemblance of its variations to the lines of a map, is a very elegant insect. It is globe-shaped, of a polished black, beautifully marked and spotted with carmine, and the legs curiously fringed with hairs.

The *Hydrachnæ* lay their eggs in flat clusters; and sometimes choose for that purpose the bodies of *Nepæ*, and other water insects.

The genus *Phalangium* presents a collection of insects of a very disagreeable aspect, having legs of an extraordinary length in proportion to their bodies, which are generally of a form inclined to round or oval. They seem armed for deeds of rapacity, and probably feed upon animals weaker than themselves.

One of them, the *Phalangium reniform*, is a native of the hottest climates, and equals most of the largest spiders in size. The legs are very long, and the palpi or claspers are strongly fortified on the inside with sharp, curved spines,

spines, resembling teeth, and undoubtedly designed for the same purpose. The first pair of legs are much longer than the rest, and, from their slenderness, have the appearance of antennæ.

The Shepherd Spider and Harvest Man, are of this genus, improperly classed, by popular mistake, amongst spiders, though they differ materially from them.

The real Spider, *Aranea*, forms the next genus, and it is so extensive, that it is divided into several sections, marked by the shape of the body, or the position of the eyes; which latter are eight in number, situated on the upper part or front of the thorax, and so placed, as to enable their owner to see its prey in every direction, though its head is immovable.

In the season of autumn, the *Aranea diadema* abounds in gardens. Its general colour is a deep chesnut, and the abdomen is beautifully marked with round, white spots, in a form somewhat like a diadem. This spider, after having found a convenient place of shelter, forms a large, thick web of yellow silk, in which it deposits its eggs, enclosing the round web, for greater security, with one of a looser texture. At the tip of the abdomen are placed five papillæ or teats, through which the insect draws its thread. Each of these has a vast
number

number of openings, some say a thousand, through which issues the clammy substance that forms its threads, so that every thread consists of a multitude of finer ones. The fangs or piercers, with which it wounds its prey, are strong, curved, sharp-pointed, and furnished on the inside, near the end, with an oblong hole, through which it discharges a poisonous fluid into the wound the point has made. The feet have each two claws, provided on their under side with several parallel spines, resembling the teeth of a comb, with which the creature disposes the threads of its web with the greatest regularity. Notwithstanding the beauty of this spider, there is an appearance of malignity and ferocity in its aspect, common to the whole tribe, that is extremely forbidding.

The Tarantula, of which you have heard so many incredible tales, all of them discarded by the rational examination of modern philosophers, is a native of the southern parts of Italy, and is generally found on dry and sunny plains. It is of a great size, and of a brown colour, marked on the back of the abdomen by a row of three-cornered black spots, with white edges.

The *Aranea aquatica* is a middle-sized species, of a deep chesnut colour, residing
entirely

entirely under water, where it forms a small tissue or web, confining a proper quantity of air; and it sometimes avails itself of the accommodation of an empty shell, which it closes with a slight web across the mouth.

Aranea subterranea, or Cellar Spider, is armed with strong pincers; but the wound it inflicts is not dangerous. In this temperate climate, it digs a hole in the sand, lines it with silk to keep it from falling in, and lies in ambush for its prey, upon which it frequently darts at the distance of two feet.

I cannot dismiss this genus, without mentioning the enormous spider called *Aranea avicularia*, or Bird-catcher, which is found in many parts of the East Indies and South America, where it resides among trees, lying in wait for small birds, which it seizes and destroys by wounding with its fangs, and afterwards sucking their blood. This hideous insect is very large, covered with hair, and of a uniform dusky brown.

Spiders prey upon all weaker insects, very frequently upon their own species; and, in their turn, become the victims of wasps, spheges, and ichneumons. They change their skin. Birds are very fond of the egg-bag of spiders, as well as the young that they contain.

An.

An attempt was made by M. Bon, a Frenchman, to establish a manufacture of spider's silk; but, after many experiments, it was deemed impracticable, as it required twenty-eight thousand cods to make one pound of silk; and, as none but the females spin those cods, it was necessary to breed a much greater number of spiders. But such is their carnivorous disposition, it was impossible to prevent their preying upon each other, though they were provided with the soft substance of fresh quills, which seems to be a suitable food for them. M. Bon, however, succeeded so far as to obtain two or three pair of stockings and gloves of this silk, which were of an elegant grey colour. And, could he have carried his scheme into execution, there would have been several new genuine colours in silk; such as grey, white, sky-blue, and coffee colour; whereas, the silkworm yields only different shades of yellow.

The flight of spiders is a peculiarity that deserves notice, and seems to be the privilege of the young alone. In the autumnal season, these aërial voyagers ascend some slight eminence, and, turning themselves, with their heads towards the wind, throw out several threads, and, committing themselves to the gale, they are carried to a prodigious height.

During

During their excursions, we may suppose that they are employed in catching such minute winged insects as they cannot find nearer the surface of the ground; and, when wearied, contract their limbs, suffering themselves to descend, with a gradual motion, till they reach a place of security.

Spiders frequently change their colour, which varies much according to season, sex, and age: but they are most brilliant in autumn, when they arrive at their greatest magnitude, and are in their height of vigour, which may be attributed to the plentiful supply of their prey, which abounds at that season.

From my account, you will perceive that no harm is to be apprehended from the spider's of our favoured isle; therefore, I trust that your good sense will dismiss all foolish fears, or affectation of them, at the sight of these insects; because few things mark greater narrowness of mind, than fear where there is no danger, or the trifling art of feigning timidity, which sometimes disgraces the weakest of our sex, in order to excite notice. Believe me, dear sister, ever yours,

FELICIA.

LETTER

LETTER XVII.

*FELICIA TO CONSTANCE.**Shrubbery.*

MY DEAREST CONSTANCE,

THE task of writing to you is so agreeable, that I am always pleased to find a motive for taking up my pen for that purpose. The plea of giving you a sketch of the science of Entomology, has furnished me with an excuse for frequently indulging myself in this innocent gratification, in which, I am persuaded, the pleasure is mutual. Under this impression, I the more readily proceed with the remaining genera of the seventh order; consisting, chiefly, of insects that are neither engaging in figure nor disposition.

The Scorpion is the dreaded inhabitant of warm climates, particularly Africa, where it attains to a larger size, and the poison of its sting is more malignant, than elsewhere; occasioning always painful symptoms, and sometimes death. Its form has some resemblance to that of a lobster; it being furnished with

claws.

claws, and small jointed legs. The colour varies in individuals, from a dark, glossy brown, to a reddish or yellowish hue. Its tail is armed with a sting, which inflicts the wound, that is afterwards inflamed by a poisonous fluid emitted from two small orifices on each side the tip of the sting. This creature is very prolific, bringing forth a living progeny of fifty or sixty at a birth. The young ones are white at first, but shortly require the hue of their parents. It is generally found in neglected places, hiding itself beneath stones, wood, &c. and sometimes is an unwelcome visitor in houses. Its habits are cruel and ferocious; and its favourite food is the spider, which it dismembers without mercy, and then feasts upon its vitals.

The genus *Cancer*, or Crab, presents a great variety of species, differing from each other in shape, size, and colour; and includes the common Crab, the Lobster, the Crawfish, the Prawn, and the Shrimp. In one particular, however, they all agree; they cast their shells from time to time. The animal, aware of what is going to happen, retires to some place of security, till its new covering, which at first is little more than a membrane, is hardened into a shell. Some species are not provided with shells, but are dependent for a coat of defence,

on

on the chance of finding a shell deserted by its original inhabitant, accommodated to their size. Of these, the *Cancer Bernardus*, or Hermit Crab, is a striking example.

There is another peculiarity for which this race of animals is remarkable. The loss of a limb, which to most other creatures is an irreparable misfortune, is to them a matter of small moment; since a short time is sufficient to perfect the growth of another, in the place of that which accident has torn off. But it is observed, that these new limbs are smaller than the old ones.

When they are rendered defenceless by the loss of their shell, they are exposed to the attacks of many enemies; particularly the different kinds of marine polypus, which prey upon them. These creatures seem aware of their danger at this period, by placing a hard-shelled crab as centinel, to warn them of any cause for alarm. The hard-shelled crab is generally a timid animal, and, if he has no other means of escape, pretends death, and contrives to sink beneath the sand, leaving his eyes alone exposed: but on these occasions he acquires courage, and defends his charge bravely.

The instincts of the Land-Crab are very curious. At a certain season, they assemble in
vast

vast multitudes, and emigrate from the uplands towards the sea-shore: when arrived there, they deposit their spawn in the water, and then return to their usual haunts. Self-preservation is the grand law of animated beings. If one of this numerous company falls lame, or meets with an accident, his fellow-travellers devour him, that he may not be an impediment to their journey.

Most of the genus are very prolific. The Common Lobster is said to produce upwards of twelve thousand eggs each time of laying. Some of the foreign species are beautifully coloured and variegated.

The habits of the common lobster may serve as a specimen of the general manners of its congeners. It selects the clearest water, and delights to fix its station at the foot of rocks, that afford it shelter. Its breeding season is early in the summer. The eggs are deposited in the sand. When first hatched, they look somewhat like tadpoles, but gradually assume their complete form.

Most of the insects belonging to the genus *Monoculus* inhabit the water, and are exceeding small; though the *Monoculus Polyphemus*, or King Crab, is the largest of the crustaceous tribe; the body measuring, sometimes, two feet in length. It is found in the Indian ocean,
and

and a pair of them generally swim together. Its shape is flat and circular in the front, growing gradually smaller towards the hind part, where it terminates in a long, taper, pointed tail. Its colour is a yellowish brown; and its eyes, contrary to their usual situation in the other species, of being near together, in this are placed very distant from each other. They are formed like a half moon, and are fixed on a kind of pedicle, under the covert of a thick shell, and, like the eyes of dragon-flies and some other insects, are composed of innumerable globules, each, probably, possessing the power of a single eye.

The *Monoculi* are both oviparous and viviparous. They live in stagnated waters; where some species feed upon plants, whilst others are nourished with the blood of fishes, to which they firmly attach themselves. They swim, or rather spring upon the surface of the water, with a very nimble motion, and are never at rest, whether rising to the top, or sinking to the bottom of the pool. When the droughts of summer have dried up the water, they lie in a torpid state till the renewal of their favourite element restores them to life and enjoyment.

The *Monoculus pulex*, or Water-flea, abounds so greatly, as sometimes to discolour the water. Though not longer than the tenth of an inch,
its

its construction is curiously adapted to its necessities. The body is enclosed in a bivalve, transparent shell, which, when examined by the microscope, appears like fine net-work. On each side of the head is a strong, transparent, jointed arm, forked, and terminating in several branches; which enables it to move in any direction, by waving it as a bird does its wings.

The genus *Oniscus*, popularly called Woodlouse, contains but few species. They are found in houses, gardens, and under the bark of decayed trees. It is too well known to need a description of its figure. The Armadillo is sometimes used in medicine; and, when alarmed, has the faculty of rolling itself up into the form of a brown pea; the scales of its back sliding over one another, like those of the quadruped of the same name.

The *Oniscus aquaticus* is found in pools, small rivulets, especially springs, and sometimes in the sea. They are good swimmers, and differ from those that inhabit the land, by bringing forth their young alive.

The foreign species of the genus *Scolopendra*, or Centipede, are formidable insects, inflicting a very painful wound. They infest many parts of Asia, Africa, and South America; and, as they often creep into houses, the inhabitants

habitants secure themselves from these dangerous enemies, during the night, by placing the feet of their bed-posts in vessels of water.

Scolopendra forficata is the largest species found in our island, and is frequently seen in moist places; such as decayed wood, beneath stones, garden pots, &c. It has a fine polish on its skin, which is nearly of the same colour as that of a chesnut. On each side it is furnished with fifteen legs, which enable it to move with agility and elegance.

One species, *Scolopendra electrica*, when disturbed, emits a phosphoric light of considerable brilliancy. As this appearance has not been noticed whilst the creature is at rest, we may suppose it arises from a voluntary act, designed as a defence, or a mark of hostility.

The last genus, *Julus*, has a near affinity with the *Scolopendræ*, in figure and habits; but differs from them in having a round, instead of a flat body; and having two pair of feet to each ring, whilst the *Scolopendræ* have only one. The mouth is armed with toothed jaws, of a curved shape, which have a formidable appearance; but the creature, when touched, seems to rely for safety on its facility of rolling itself up in a flat spiral, with its numerous feet turned outwards, and, at the same time, inclined towards the ground.

The

The *Julus sabulosus* is very common in the soft mould of hollow trees. The young, when first hatched, are of a whitish hue, though they gradually acquire a colour approaching to black. At that time, three pair of legs only appear: in a few days the number is increased, and, by the time the insect has attained maturity, amounts, on each side, to an hundred and twenty.

We have now gone through the seven orders of insects, and, you must agree, that they present a curious and surprising display of harmony, variety, beauty, and contrivance, in their structure; the most extraordinary diversity in their metamorphoses; and the most interesting design in their habits, whether considered with reference to providing for their young, defending themselves from their enemies, or laying snares for their prey. Notwithstanding so much has been discovered of the wonders of this tiny order of beings, by the patient investigation of naturalists, assisted by the microscope, it cannot be doubted that a great many surprising instances of the exquisite wisdom which has formed them, and established the laws by which they are governed, elude our search; and that there still remains a wide field, for the attentive observation of those who delight to look through Nature up to Nature's

God. Those who have made the deepest researches into the mysteries of creation, are the most sensible that numberless hidden springs lie beyond the reach of their comprehension; and, as science advances, this imperfection is more clearly perceptible. But, so far from being discouraged by this consideration, we should be stimulated to fresh exertions; certain, if we fail of our object, of increasing our knowledge, and exciting new motives for admiration and love. Vanity alone can induce a man to be satisfied with his own discoveries. It is said that Buffon caused the following presumptuous boast to be inscribed on his own statue: "A genius equal to the majesty of nature." But, says that eminent naturalist, Sir James Edward Smith, a single blade of grass is sufficient to confound his pretensions.

The wisdom and power displayed in the formation of the visible objects around us, command our admiration; whilst the benevolence so strikingly apparent in the provision for the enjoyment of the lowest order of animated beings, calls forth our gratitude, love, and praise. The animalcule, that is too minute to be discerned by the naked eye; the polypus, whose nature approaches so nearly to that of vegetables, that, when divided into several pieces, each piece, like the cuttings of a plant, becomes

becomes a complete individual of its original kind, enjoys a degree of happiness proportioned to its capacities. How deeply it is to be regretted, that this benevolent system should ever be interrupted by the thoughtlessness or wanton cruelty of man ; and yet how frequently do we see the most unnecessary barbarity inflicted on all the tribes of animals that fall under his dominion. The first lesson I would teach a child, is humanity towards every thing that has feeling ; for I am confirmed in the opinion, that spinning cockchafers, pulling off butterflies' wings, and killing flies, have hardened many a young heart, and prepared the way for the most atrocious crimes.

The expectation of your return to our home-circle, reconciles the departure of summer, and leads me to anticipate great pleasure in passing the long winter's evenings, in recapitulating the little knowledge we have gained in the interesting science of Entomology ; for which purpose I have prepared a table of the orders and genera, which I enclose, as an assistance to your memory.

Believe me, with every sentiment of tender affection, ever yours,

FELICIA.

ARRANGEMENT OF INSECTS

INTO

Classes, Orders, and Genera.

CLASS.

INSECTS.

Antennæ two. Legs six, or more. They breathe through lateral spiraculæ; and are divided into orders, from the circumstance of their having or wanting wings, and from the number and substance of which those parts are composed.

Insects are divided into seven Orders.

1st. COLEOPTERA.

2d. HEMIPTERA.

3d. LEPIDOPTERA.

4th. NEUROPTERA.

5th. HYMENOPTERA.

6th. DIPTERA.

7th. APTERA.

1. COLEOPTERA,

1. COLEOPTERA,

Consists of insects which have four wings: the upper ones are called elytra, or wing-cases. They are of a hard, horny substance, and meet on the upper part of the body, in a direct line.—Beetles, &c.

2. HEMIPTERA,

Which have four wings: the upper ones (elytra) resemble strong vellum or parchment. They cover the body horizontally. The inner margins extend the one over the other, not meeting in a direct line, as in the Coleoptera. Beak curved downwards.—Cricket, &c.

3. LEPIDOPTERA.

Having four wings, all membranaceous, or covered with scales, fixed upon them like tiles upon the roof of a house; these, when magnified, appear like feathers. Tongue or trunk spiral. Body hairy.—Butterfly, Moth.

4. NEUROPTERA.

Four wings, membranaceous, but naked; they appear like net-work. No sting.—Dragon-fly, &c.

5. HYMENOPTERA.

Four membranaceous wings, which are naked. The tails of the females are armed with a sting.—Bee, &c.

6. DIPTERA.

Having only two wings, and are furnished with poisers or balancers, (called halteres,) instead of under wings.—Fly, &c.

7. APTERA.

7. APTERA.

Having no wings in either sex at any period.—
Spiders, &c.

THE SEVEN ORDERS ARE SUBDIVIDED INTO
GENERA.

1st. Order, *Coleoptera*, contains the following
genera.

1. Genus *Scarabæus*. Beetle.

Antennæ clavated, with a fissile tip. Legs generally
toothed. Body thick and compact.

2. *Lucanus*. Stag-beetle.

Antennæ clavated, with compressed tip, divided into
lamellæ on the inner side. Jaws stretched forward, and
toothed.

3. *Dermestes*. Leather-chafer.

Antennæ clavated, with three joints, perfoliated.
Thorax convex. Head withdrawn at pleasure beneath
the thorax.

4. *Ptinus*. Ptinus.

Antennæ filiform. Joints towards the end longest.
Thorax roundish, concealing the head.

5. *Hister.* *Hister.*

Antennæ broken in the middle, with a solid bulb at the end. Head retractile. Fore-legs toothed.

6. *Gyrinus.* Glimmer-chafer.

Antennæ clavated, stiff, shorter than the head. Eyes (apparently) four, two above and two below.

7. *Pausus.* *Pausus.*

Antennæ of two joints, the upper large and hooked. Head stretched forwards. Wing-sheaths flexile.

8. *Byrrhus.* *Byrrhus.*

Antennæ clavated, solid, compressed.

9. *Sylpha.* *Sylpha.*

Antennæ thickening towards the tip. Head prominent. Thorax margined.

10. *Cassida.* Helmet-beetle.

Antennæ knotted, enlarging towards the end. Thorax and wing-sheaths margined.

11. *Coccinella.* Lady-bird.

Antennæ knotted and truncated. Palpi longer than the antennæ. Body hemispheric. On each foot three joints.

12. *Chrysomela.* *Chrysomela.*

Antennæ knotted, and enlarging towards the tip. Thorax margined. Body oblong.

13. *Hispa.*

13. *Hispa.* *Hispa.*

Antennæ spindle-shaped, situated near to each other at the base, between the eyes. Thorax and wing-shells generally covered with spines.

14. *Bruchus.* *Bruchus.*

Antennæ filiform, gradually thickening. Head drawn back. Wing-shells shorter than the abdomen.

15. *Curculio.* *Weevil.*

Antennæ clavated, and fixed in the snout, which is prominent and horny.

16. *Attelabus.* *Attelabus.*

Antennæ thickening towards the tip. Head narrow behind.

17. *Cerambix.* *Cerambix.*

Antennæ jointed, and tapering to the end. Thorax either spiny or bulging. Wing-sheaths long and narrow. Body oblong.

18. *Leptura.* *Leptura.*

Antennæ tapering to the end. Wing-sheaths narrower towards their extremity. Thorax of a roundish and slender form.

19. *Necydalis.* *Necydalis.*

Antennæ setaceous. Wing-sheaths smaller, shorter, or narrower than the wings. Tail simple.

20. *Lampyris.*

20. *Lampyris.* Glow-worm.

Antennæ filiform. Wing-sheaths flexible. Thorax flat and semi-orbicular, surrounding and concealing the head. Abdomen, with the sides plaited into papillæ. Female (in most species) wingless.

21. *Cantharis.* Cantharis.

Antennæ taper. Thorax margined, shorter than the head. Wing-sheaths flexible. Abdomen plaited into papillæ.

22. *Elater.* Skipper.

Antennæ taper, lodged in a groove under the head and thorax. Body oblong, with a spine situated beneath the thorax, that enables the insect to skip with great force.

23. *Cicindela.* Sparkler.

Antennæ taper. Jaws prominent, denticulated. Eyes prominent. Thorax roundish and margined.

24. *Buprestis.* Cow-burner.

Antennæ taper, length of the thorax. Head half concealed.

25. *Dytiscus.* Diver.

Antennæ setaceous. Hind feet hairy, formed for swimming, and armed with small claws.

26. *Hydrophilus.* Hydrophil.

Antennæ increasing in size towards the end, with a perfoliated head. Hind legs hairy, and formed for swimming.

27. *Carabus.*

27. *Carabus*. Bull-head.

Antennæ taper. Thorax and wing-shells margined, the former somewhat heart-shaped.

28. *Tenebrio*. Darkling.

Antennæ moniliform; the last joint rounder than the others. Thorax margined. Head stretched forward. Wing-sheaths rather stiff.

29. *Meloe*. Blossom-eater.

Antennæ moniliform, the last joint oval. Thorax roundish. Wing-sheaths soft. Head gibbous, and bent downwards.

30. *Mordella*. The Nibbler.

Antennæ filiform, serrated. Head bent downwards. Feelers compressed, clubbed, and obliquely truncated. Wing-sheaths curving downwards towards the tip.

31. *Staphylinus*. Rove-beetle.

Antennæ moniliform. Wing-sheaths halved. Wings folded up and concealed. Tail simple, showing out occasionally two oblong vesicles.

32. *Forficula*. Earwig.

Antennæ tapering. Wing-sheaths much shorter than the abdomen. Wings folded and covered. Tail furnished with a pair of forceps.

2d. Order, *Hemiptera*, contains the following genera.

1. *Blatta*. Cock-roach.

Antennæ taper. Head bent downwards. Thorax orbicular, margined. Feet formed for running. Hornlets two, over the tail.

2. *Mantis*. Sooth-sayer.

Antennæ taper. Head unsteady, armed with jaws, and furnished with feelers. Wings four, membranaceous; the lower pair plaited. Fore-legs, in most species, toothed beneath, and armed with a single claw; with a setaceous jointed foot. Hind legs smooth, formed for walking.

3. *Gryllus*. Locust.

Antennæ, in some species taper, in others filiform. Head bent downwards, armed with jaws, and furnished with feelers. Wings folded and concealed. Hind legs formed for leaping. Claws double on all the feet.

4. *Fulgora*. Lantern-fly.

Antennæ situated below the eyes. Head lengthened into an inflated, hollow front. Snout bent inwards, under the body. Feet formed for walking.

5. *Cicada*. Frog-hopper.

Antennæ very short and taper. Wings four, membranaceous, declining along the sides of the body. Rostrum bent inwards under the breast. Feet, in most species, formed for leaping.

6. *Notonecta*.

6. *Notonecta.* Boat-fly.

Antennæ beneath the eyes, and shorter than the thorax. Wings folded together crosswise. Hind feet edged with hairs, and formed for swimming.

7. *Nepa.* Water Scorpion.

Snout bent downwards. Wings folded together crosswise, fore-part coriaceous. Fore-feet cheliform or clawed, the rest formed for walking.

8. *Cimex.* Bug.

Antennæ longer than the thorax. Snout bent downwards. Wings folded together crosswise. Back flat. Feet formed for running. Some are without wings.

9. *Aphis.* Leaf-louse.

Antennæ longer than the thorax. Snout bent downwards. Wings four, either upright or none. Abdomen generally forked. Feet formed for walking.

10. *Chermes.* Chermes.

Antennæ longer than the thorax, which is gibbous. Rostrum placed in the breast. Wings four, deflexed. Feet formed for walking.

11. *Coccus.* Cochineal.

Trunk proceeding from the breast. Abdomen bristled in the hind part. Wings two, upright in the males. Females wingless.

12. *Thrips.*

12. *Thrips.* *Thrips.*

Antennæ the length of the thorax. Snout obscure. Body narrow. Abdomen bent upwards. Wings four, straight and narrow.

3d. Order, *Lepidoptera*, containing the following Genera:1. *Papilio.* *Butterfly.*

Antennæ clavated, commonly terminating in a knob. Wings, when at rest, erect. Fly by day.

2. *Sphinx.* *Sphinx.*

Antennæ thickest in the middle. Wings, when at rest, bent down. Flight strong, and commonly in the evening or morning.

3. *Phalæna.* *Moth.*

Antennæ gradually lessening from base to tip. Wings, when sitting, in general bent downwards. Fly by night.

4th. Order, *Neuroptera*, containing the following Genera:1. *Libellula.* *Dragon-fly.*

Antennæ very short. Mouth furnished with several jaws. Wings four, extended. Tail of the male forked.

2. *Ephemera.*

2. *Ephemera*.**Day-fly.**

Antennæ very short. Mouth without teeth or feelers. Stemmata two, very large, above the eyes. Wings erect. Second pair very small. Tail bristled. Short lived.

3. *Phryganea*.**Phryganea.**

Antennæ longer than the thorax. Mouth without teeth, with four feelers. Stemmata three. Wings incumbent, the lower pair plaited.

4. *Hemerobius*.**Hemerobius.**

Antennæ longer than the thorax, taper, stretched forwards. Mouth prominent, with two teeth and four feelers. Stemmata wanting. Wings deflected, and not plaited.

5. *Myrmeleon*.**Ant-eater.**

Antennæ clavated, length of the thorax. Wings deflected. Stemmata none. Mouth furnished with jaws. Teeth two, feelers four. Tail of the male furnished with a forceps, consisting of two straightish filaments.

6. *Panorpa*.**Panorpa.**

Antennæ longer than the thorax. Snout horny, cylindric, with two feelers. Stemmata three. Tail in the male, furnished with a claw.

7. *Raphidia*.**Raphidia.**

Antennæ as long as the thorax, which is of a cylindric form, and lengthened out in front. Head depressed, horny.

horny. Mouth with two teeth; four feelers. Stemmata three. Wings deflected. Tail of the female furnished with a bristle that turns back.

5th. Order, *Hymenoptera*, contains the following Genera:

1. *Cynips*. Gall-fly.

Mouth with jaws, but no proboscis. Piercer, or sting, spiral, mostly concealed within the body.

Tenthredo. Saw-fly.

Antennæ differing. Wings extended, swelled, or inflated. Jaws, but no proboscis. Scutellum, with two distant granioles. Sting serrated, between two valves.

3. *Sirex*. Tailed Wasp.

Antennæ filiform, with more than twenty-four joints. Mouth with two strong jaws. Feelers two, truncated. Sting rigid, serrated, projected. Abdomen united to the thorax.

4. *Ichneumon*. Ichneumon.

Antennæ with more than thirty joints. Mouth with jaws, no tongue. Abdomen generally joined to the body by a sort of foot-stalk. Piercer, or sting, within a bivalve sheath.

5. *Sphex*.

5. *Sphex*. Savage.

Antennæ of ten joints. Mouth armed with jaws, no tongue. Wings extended, not folded. Sting sharp, concealed.

6. *Chrysis*. Golden-fly.

Antennæ filiform; the first joint long, and the remaining eleven short. Thorax joined to the abdomen by a short pedicle. Mouth with jaws, no proboscis. Sting single. Wings flat. Body gilded.

7. *Vespa*. Wasp.

Mouth with jaws, no proboscis. Upper wings plaited. Sting concealed. Eyes lunated. Body smooth.

8. *Apis*. Bee.

Mouth armed with jaws, and furnished with a proboscis, enclosed in a bivalve sheath, and inclined downwards under the body. Body hairy. Sting in the female and neutral insects concealed.

9. *Formica*. Ant.

Antennæ filiform. Head large. An erect scale between the thorax and abdomen. Mouth with large jaws, and four unequal feelers. Sting concealed; males have none. Males and females winged. Neutrals apterous.

10. *Mutilla*. Mutilla.

Antennæ filiform. Wings mostly wanting. Body downy. Thorax blunted at the base. Sting concealed.

6th. Order,

6th. Order, *Diptera*, containing the following
Genera:

1. *Oestrus*. Gad-fly.

Antennæ taper, growing from a small point. Mouth a simple orifice. Feelers two. Stemmata three.

2. *Tipula*. Crane-fly.

Head long. Feelers curved. Proboscis short, and bent inward. Upper jaw like an arch.

3. *Musca*. Fly.

Mouth formed into a fleshy proboscis, with two lateral lips. Palpi none.

4. *Tabanus*. Tabanus.

Trunk fleshy, terminated by two lips. Palpi, one on each side of the trunk.

5. *Culex*. Gnat.

Antennæ, in the males, feathered. Mouth, consisting of setaceous piercers, within a flexible sheath.

6. *Empis*. Empis.

Mouth with a horny, inflected, bivalve snout, longer than the thorax, with horizontal valves.

7. *Conops*. Conops.

Mouth with a long, jointed snout.

8. *Asilus*.

8. *Asilus*. *Asilus*.

Mouth with a straight, horny, bivalve snout.

9. *Bombylius*. *Buzz-fly*.

Trunk taper, very long and sharp, between two horizontal valves, in which are contained stings or bristles.

10. *Hippobosca*. *Horse-fly*.

Antennæ like a single hair. Mouth furnished with a bivalve, cylindric, obtuse, and shaking beak. Feet terminated with several claws. Body flat, hard, and scaly.

7th. Order, *Aptera*, containing the following
Genera :

1. *Lepisma*. *Lepisma*.

Legs six, formed for running. Palpi movable. Body scaly. Tail furnished with extended bristles.

2. *Podura*. *Springtail*.

Antennæ long, taper. Legs six, formed for running. Eyes two, composed of eight small ones. Tail forked, formed for leaping, bent inwards under the body.

3. *Termes*. *Termes*.

Antennæ taper. Legs six, formed for running. Eyes two. Mouth with two jaws.

4. *Pediculus*.

4. *Pediculus.* Louse.

Antennæ length of the thorax. Legs six, formed for walking. Mouth producing a sting. Abdomen depressed, and appears as if formed of different lobes.

5. *Pulex.* Flea.

Antennæ filiform. Legs six, formed for leaping. Eyes two. Trunk taper, bent, concealing the sting. Abdomen compressed.

6. *Acarus.* Mite.

Legs eight. Eyes two, situated on each side of the head. Feelers two, jointed, leg-shaped.

7. *Hydrachna.* Hydrachna.

Head, thorax, and abdomen united. Feelers two, jointed. Eyes two, four, or six. Legs eight, formed for swimming.

8. *Phalangium.* Phalangium.

Antennæ fixed to the fore-part of the head, and made like the feet. Legs eight. Eyes, two on the summit of the head, and two on the sides. Abdomen round.

9. *Aranea.* Spider.

Legs eight. Eyes eight. Feelers two, jointed; the tips of which, in the male, distinguish the sex. Mouth furnished with two hooks. Abdomen terminated by papillæ,

papillæ, or teats, through which the insect draws its thread.

Scorpio. **Scorpion.**

Antennæ, or palpi, like claws, on the head. Legs eight. Eyes eight; three on each side of the thorax, and two on the back. Tail long, jointed, and terminated by a curved piercer. On the under side, two toothed processes, resembling combs.

11. *Cancer.* Crab.

Antennæ four, beneath the eyes. Feelers six, unequal in length. Legs eight, sometimes six or ten; besides two arms, terminated by claws. Eyes two, movable; generally projecting, or placed upon a stalk. Tail jointed, unarmed.

12. *Monoculus.* Monoculus.

Antennæ used in swimming and leaping. Feet made for swimming. Body covered with a shell. Eyes fixed in the shell, and, in most species, very near one another.

13. *Oniscus.* Oniscus.

Antennæ taper and bent. Legs fourteen. Body oval.

14. *Scolopendra.* Centipede.

Antennæ taper. Legs numerous, equal to the number of the segments of the body on each side. Feelers two, jointed. Body depressed.

15. *Julus.*

15. *Julus.* *Julus.*

Antennæ beaded. Feelers two, jointed. Legs numerous; twice as many on each side, as the segments of the body.

SPECIES.

The next division is into Species, which are extremely numerous; as is shown in the genus *Ichneumon*, which is supposed to contain twenty-seven species. The *Lepidoptera* order has but three genera; yet Harris gives above four hundred, of British species alone, in these three.

THE END.

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